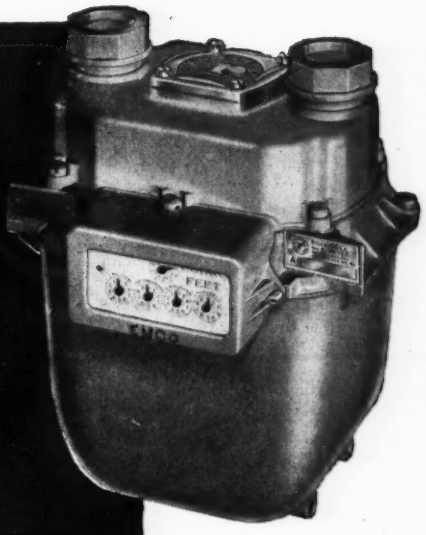
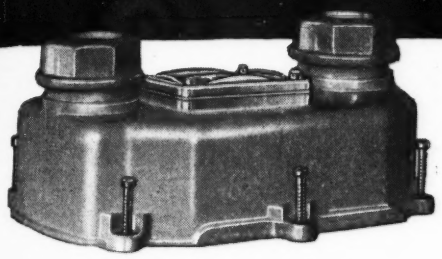
YOUR OLD FAVORITE . . .

Nº O





All improvements to the working mechanism can be incorporated into Rockwell-Emco meters of previous manufacture.

BETTER MATERIALS—The outer housing is made of strong aluminum alloy pressure castings. Steel spud inserts prevent threads from galling and give extra reinforcement to the cover. A hand hole plate in the cover permits external adjustment of the tangent.

EASIER TO HANDLE—The improved Rockwell No. 0 meter is lighter and easier to handle. That's because of the aluminum alloy body and cover. Actual weight is only 18 pounds—less than one-half that of any cast iron meter. This lighter weight saves effort on the part of those handling meters. It saves important dollars in transportation costs.

NEW SERVICE EASE—This meter has been designed with the meter repairman in mind. It can be quickly dismantled and reassembled. All parts are readily accessible. By following charted Rockwell procedures, replacements and adjustments can be made by even the inexperienced workman using standard tools.

IMPROVED PERFORMANCE—There are fewer parts in this new No. 0 meter, sixty per cent less soldered joints, a fool-proof tangent location—all of which contribute to a longer life of dependable meter performance with the highest degree of sustained accuracy.

WRITE FOR BULLETIN NO. 1100

ROCKWELL

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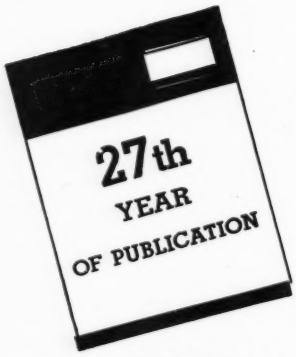

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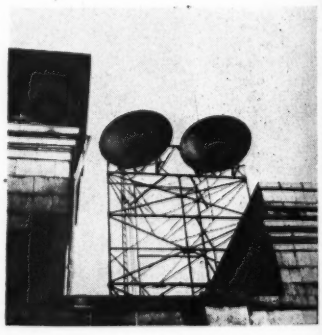

THIS ANTENNA installation is part of Keystone Pipe Line Co.'s microwave system. (Page 81.)

Thermally Thinking

the editors

Interior's Meddling Halts Pipeline Job

ARIZONA GAS USERS, or would-be natural gas users, who were counting on a new pipeline being constructed by El Paso Natural Gas Co., may still be wondering whether they are going to be chilly or comfortable next winter. It all depends on how fast Congress has acted on legislation introduced by Sen. Ernest W. McFarland (D.-Ariz.), Senate majority leader, and Rep. Harold A. Patten (D.-Ariz.), the principal purpose of which would be to place under exclusive jurisdiction of the Federal Power Commission any problems connected with putting interstate pipelines under public lands.

El Paso, which had obtained FPC approval for its $44.5 million San Juan line, found itself stymied when it ran into a portion of public lands administered by the Bureau of Public Lands, Department of the Interior, in late April. The Department of Interior served notice on the company that if the pipeline went under the public lands, it would have to file "common carrier rates." Since this palpably would have created serious problems for the pipeline company, its president, Paul Kayser, appealed to Congress for a cessation of what appeared to be a grab-for-power, at FPC expense, in the Department of the Interior.

The Senate Committee on Interstate and Foreign Commerce acted swiftly, passing the McFarland measure with alacrity. The legislation was expected to sail through the Senate, but the situation in the House of Representatives is not too clear. Chairman of the House Committee on Interstate and Foreign Commerce, Rep. Robert Cross (D.-Ohio) is ailing and aged. He is also, generally, a good administration follower. Regardless of the reasons, the House committee had not acted at press time.

Paul Kayser, president of El Paso, was optimistic about the eventual outcome, but he threatened to go into U. S. District Court to test Interior's power to demand a permit of any pipeline passing under public lands.

The rule of common sense is on the side of the pipeline company.[1] But what happens in Washington these days hardly can be measured by the rule of common sense. It is possible that Congress, due to the snafu on other more pressing legislation, may delay passage of the McFarland-Patten legislation. Meanwhile, construction of the pipeline has come to a dead halt, awaiting Washington action.

Getting OPS in the Act

UTILITIES WOULD BE compelled to give 30 days advance notice to the Office of Price Stabilization under the recommendations sent to Capitol Hill by President Harry Truman for the second year of the Defense Production Act, now under Congressional consideration.

The President's recommendation became part of the Maybank Bill (S. 1397) and the Spence Bill (H. R. 3871), which also contain a provision that OPS would have an opportunity to be heard before local regulatory bodies in opposition to proposed rate changes. Existing law exempts utilities which do not sell their services for resale to the public even from the necessity of submitting such notices to OPS.

In essence, the President's proposal is a revival of the old provision in the Office of Price Administration working kit in World War II. The OPA took much advantage of this provision, set up an elaborate utilities division and went out to garner quite a few headlines, but no victories, throughout the nation.

It is generally considered in Washington that the President's recommendations, for the most part, will be gently overlooked by the Congress, but some provision such as this one may squeak through. Utilities representatives—including gas men—are expected to try to knock such as this out, if possible, since the provision would be a nuisance and would not "protect" the public one iota.[2]

Early Phillips Decision Expected

THE FEDERAL POWER COMMISSION is getting ready to issue a "quickie" decision in the Phillips Petroleum Co. case, asserting its rights (it is believed in informed circles in Wahsington) to take jurisdiction in the case. Promptly, following the assertion of its right to take jurisdiction, if this is the decision, the FPC already has promised to begin immediate hearings into the rates charged by Phillips to end-use distributors in Milwaukee and other parts of Wisconsin, and in Detroit.

By its decision in early May to restrict its Bartlesville (Okla.) hearing only to the question of jurisdiction, which attorneys for Phillips insisted was the prime issue to be decided, the FPC threw consternation into the ranks of those forces which are anxious to have the FPC set rates and otherwise control prices of natural gas from the wellhead to the end-users.

A delegation of powerful politicians from Wisconsin called on Mon Wallgren, chairman of the FPC, causing the agency to issue a release on such a call (while a case was in actual progress of being heard) for the first time in FPC history. The news release pointed out that the group calling on the chairman included Gov. Walter J. Koehler, of Wisconsin; John Doerfer, chairman of the Wisconsin Public Service Commission; Frank P. Zeidler, mayor of Milwaukee, and Vernon W. Thomson, attorney general of Wisconsin, in addition to many attaches and assistants. FPC Chairman Wallgren was quoted as having assured the group that after

[1]Crosby, Samuel H. What Is Public Convenience and Necessity? *GAS*, Nov. 1950, p. 86. Clark, Bill. The Common Carrier. *GAS*, March 1950, p. 86.

[2]Last month OPS filed a petition to intervene in the case is which Mississippi River Fuel Corp., St. Louis, is seeking increased rates on sales to distributors. The FPC hearing was to begin May 14.

the FPC had ruled on the question of jurisdiction, it then would take up the question of rates immediately.

In other words, there seemed to be little doubt in his mind about what the FPC would rule on the question of jurisdiction.

Phillips, which has been able to delay the case for 2½ years, and obviously was continuing to try to delay it by opposing consideration of jurisdiction and rates at the same hearing, is going to be somewhat surprised at the speed with which the FPC can act in the coming weeks. However, no matter how fast the agency acts, it seems certain that Phillips will go to court again, in hopes that by the time the final decision is handed in, Congress will have acted, political conditions may have changed, or other factors may alter the picture.

Will Death Take the Gas Load?

A WAVE OF DEATHS in recent months from faulty gas appliances in Lower Manhattan (in the city of New York), which has at last brought some official action by the city fathers, has also brought the local utility face-to-face with a delicate, but highly pertinent, question:

Where should the responsibility of a gas utility end?

That utility has always held that its responsibility ends at the meter, and the action of the city board of health on May 15 would seem to give tacit approval to this concept. At least the amendment to the city's sanitary code, passed at that time, demanded no reconsideration of the policy. So the utility's skirts are clean. Which is as it should be; to pin liability on a utility's shoulders would be to burden it with a responsibility so onerous that it might be driven out of business.

But can it turn its back on the problem? Is it as simple as that?

In the past 10 years, 2442 persons have been accidentally killed by gas poisoning in New York—suicides specifically not included, although just how in every case it can be determined that a case was or was not accidental is moot. However, unless gas has been used as an instrument of gang warfare, the figure is probably of the correct magnitude if not absolutely accurate. Twenty deaths from aging gas refrigerators alone since Christmas of 1949 spurred the city into inquiries, the New York newspapers into editorializing, and GAMA into stepping forth with an unaccustomed boldness to blast the utility for its lack of a service policy.

Then the health department went to work. Fifty investigators began a house-by-house hunt for defective appliances in Lower Manhattan, the critical area where 40.5% of the 2442 deaths occurred. In one day the sleuths turned up 146 defective gas ranges, 23 defective refrigerators, 16 other defective appliances. In two weeks they unearthed 1565 faulty ranges, 199 refrigerators, and 95 other malfunctioning appliances.

It was these findings that led the board of health to place responsibility on the landlords, thus closing a tragic gap in the city's regulatory purview. Previously the landlord or his agent had been held to answer only for the integrity and proper operation of the building's piping system.

One act remained—the approval of a bill requiring licensing of representatives of the service companies which contract with landlords for this work. At press time, this bill was under consideration.

Meanwhile the utility remains a bystander. Rectification of the situation is not within its power, by choice. The wonderful fuel, part of which has been brought 1800 miles, with great fanfare—and to the unconcealed chagrin of Southwesterners who recognize its worth—will continue to be dumped into equipment designed for our grandmothers. Condemned equipment will likely be replaced by electric appliances, since no gas salesman will be on the spot to undo the damage. Gradually the load may go by default, for want of a service policy.

Without servicing, how can a load be held? By the same token, without a load-holding policy, where is the self-interest that would dictate an aggressive service policy?

An active servicing *and* merchandising program would have ferreted out the klunkers, replaced them with gleaming new gas appliances, and held—and built—the load.

That is, if anyone really *wanted* to hold it.

The Story's Weak

WE TRIED a little needling campaign last month, on a limited basis of course. We tried hard to dig up a few arguments against electric gas range ignition, and are happy to report we got nowhere. Either the anti-electric camp is breaking up, or they just ain't talkin'.

The only argument we could elicit went something like this: If we start depending upon electricity to ignite our gas ranges, salesmen will naturally say to a customer—"As long as you're considering a part-electric range, why not go all-electric?"

No reason at all, of course, unless she just happens to prefer cooking with gas. She should realize that she still would be, even with electric ignition; if she couldn't see through that line, she would hardly *deserve* to cook with gas.

Many housewives, we suspect, even prefer "flame cookery" so much that they'll continue to light their gas ovens with a match. As long as they're using wood, we can't help but wonder why they don't go all-wood.

Makes sense—of a sort.

Personally, we think that if gas salesmen can't sell against such a leaky story, they'd better start looking for a more suitable occupation.

CPR 22: Pattern for Price Confusion?

GAS APPLIANCE OUTPUT, which hit a record high level during the first quarter, likely will not reach such peaks again soon.

Matter of fact, members of the Household Refrigerators and Freezers Industry Advisory Committee, meeting with Office of Price Stabilization officials, were quite worried about some of the major pricing problems they faced under CPR 22, as well as being disturbed at the contemplated cutback of materials with which to manufacture. This concern is felt throughout appliance manufacturing generally.

The industry members pointed to three factors under CPR 22, the manufacturers' ceiling price order, which disturb them: (1) the fact that tooling costs cannot be included as materials cost in determining ceilings; (2) increased cost of steel which is now having to be purchased from warehouse stock at increased prices and was historically purchased directly from the mill during the base period, although the increased cost is not permitted to be passed on under CPR 22, and (3) the inability to set up retail list prices which retailers and wholesalers can use in setting ceiling prices.

Historically, the members stated, they have operated on the basis of published retail suggested list prices, with fixed discounts from the retail list prices in determining prices at the wholesale levels. Members felt that to discard this method of list pricing would demoralize the industry at the retail and wholesale levels. The industry members asked that OPS issue a temporary supplementary regulation permitting manufacturers to file suggested retail list prices at the same time they file ceiling prices under CPR 22, and permit use of such list prices at the retail and wholesale levels, provided such list prices are based on the historical markups and discounts of the individual manufacturer.

Technical Trends

guy corfield

Plenty Of Helium

HELUM IS ORDINARILY thought of as being a rare and very valuable gas, but actually it is no longer rare, nor even scarce or expensive. It is obtained from natural gas occurring in various localities, the raw gas containing as much as 8% in the Rattlesnake field in northwestern New Mexico. It is separated from natural gas by low temperature liquefaction of the other constituents, and finally purified by activated charcoal. It can be produced by plants of the U. S. Bureau of Mines in considerably greater quantity than at present, if required. The greatest annual use was 135 MMcf in 1944, and the bureau now has four plants available that can produce in excess of 150 MMcf annually at a cost of about 1.5 cents per cu ft. It can be bought in 200-cu ft, 2000-psig cylinders through distributors in most large cities.

Helium has many unusual properties. According to statements of Cattell and Wheeler of the U. S. Bureau of Mines, it is colorless, odorless, and tasteless. It diffuses more rapidly, flows through an orifice faster, conducts heat better, and transmits sound at a higher velocity than any other gas except hydrogen. It conducts electricity better than any other gas except neon. It has a lower solubility in water and other liquids, a lower refractive index, and a lower temperature of liquefaction than any other gas. Like hydrogen and neon, it has a negative Joule-Thomson effect at ordinary temperatures; that is, it becomes warmer upon being expanded through an orifice, instead of cooler like most gases.

Some of the uses of helium are: as an inert "blanket" for the shielded-arc process for welding aluminum, magnesium, and stainless steel; as a non-combustible inflation medium for captive balloons; as a gas migration tracer in underground gas and oil fields; as a test gas for determining tightness of vacuum or pressure vessels; as a leakage tracer for gas transmission or distribution lines. The latter three applications make use of the ability to quantitatively detect very small concentrations of helium in other gases by means of apparatus developed by the Bureau of Mines and by a simplified portable mass spectrometer.

Let's Test This Paint

ONE OF THE MOST DIFFICULT tests, to make practically and effectively, is that of the expected performance and value of a protective paint. If a new paint is not tested in some way its use on a large structure may be a costly experiment. The impulse is, then, to apply it in small test patches on typical structures, or on test panels that can be exposed in typical locations. A difficult but important decision must then be made on the method of application (surface cleaning, number of coats, brush or spray, etc.) to be representative of its practical large area use.

Moreover, if the paint is of any value it will last at least a year without failure, and possibly the maintenance superintendent will have been unable to wait that long and will have used something else, or will want to use it at another location or on another type of structure and will not be sure if the test results apply to the new conditions; or the paint manufacturer will have changed his formula or gone out of business, or at least there will be serious doubt as to whether currently available paint is identical with the samples obtained previously.

If an attempt is made to accelerate the tests by exposing the samples at the sea shore or in desert sun, or in cooling tower spray or in similar corrosive environments, so that breakdown will take place in less than a year, it is not probable that failures during summer months will be comparable with breakdown during winter months.

It is not intended by this discussion to imply that atmospheric paint exposure tests are of no value. Most manufacturers, many users, and a number of testing and standardizing agencies employ such tests. The American Society for Testing Materials, for instance, has just set up seven paint test sites at representative locations throughout the United States. As an overall result, the technology of protective paints is constantly improving, and by stating the intended use and paying a reasonable price to a reputable manufacturer the user can obtain a serviceable product. However, if tempted by a new cheap product, or by a policy of forcing down the price by encouraging highly competitive bidding—and attempting to evaluate the offered material by exposure tests—the purchaser must accept the risks of the above enumerated difficulties or pitfalls.

Another way of testing is, of course, to use a laboratory type of accelerated test such as provided by the "weatherometer," wherein the samples are subjected to controlled durations and cycles of ultraviolet light, heat, and moisture. There are again several difficulties or objections to such methods: The weatherometer assembly itself is initially expensive and requires laboratory facilities and personnel for operation; it is not easy to control all the variables; and the results still have to be correlated in some manner with actual non-accelerated performance, because two materials which show equal weatherometer resistance might not be equal in a given type of practical service. It would seem possible, however, through a series of carefully controlled weatherometer vs. atmospheric exposure tests, to develop weatherometer conditions and cycles and failure times which would indicate the value of a coating for various uses.

Such a program has recently been instituted at the National Bureau of Standards by the Building Technology Division, in a new laboratory building. This building provides a central working space, hoods containing six exposure machines built at the bureau and five commercial types, air temperature control equipment, water-treating apparatus, and electric current and voltage regulation for the ultraviolet light arcs, as well as an exposure rack on the roof to hold 3000 test panels. This installation is expected to provide statistical correlation between outdoor weathering in the Washington, D. C. area and the accelerated conditions in the various machines. Presumably the bureau will ultimately be able to extend this correlation to other areas in the U. S.

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to better fit your exact needs

ORONITE CHEMICAL COMPANY

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824 WHITNEY BLDG., NEW ORLEANS 12, LA.

To Bulwark Free Enterprise

WE KEEP OUR EMPLOYEES INFORMED

By F. W. PETERS
Oklahoma Natural Gas Co.

A great many speakers these days are talking about our free enterprise system and communism. Much printers' ink is being splashed all over our magazines and newspapers on the same subject. Businesses such as ours are being admonished to tell the story of free enterprise and the truth about communism to their employees.

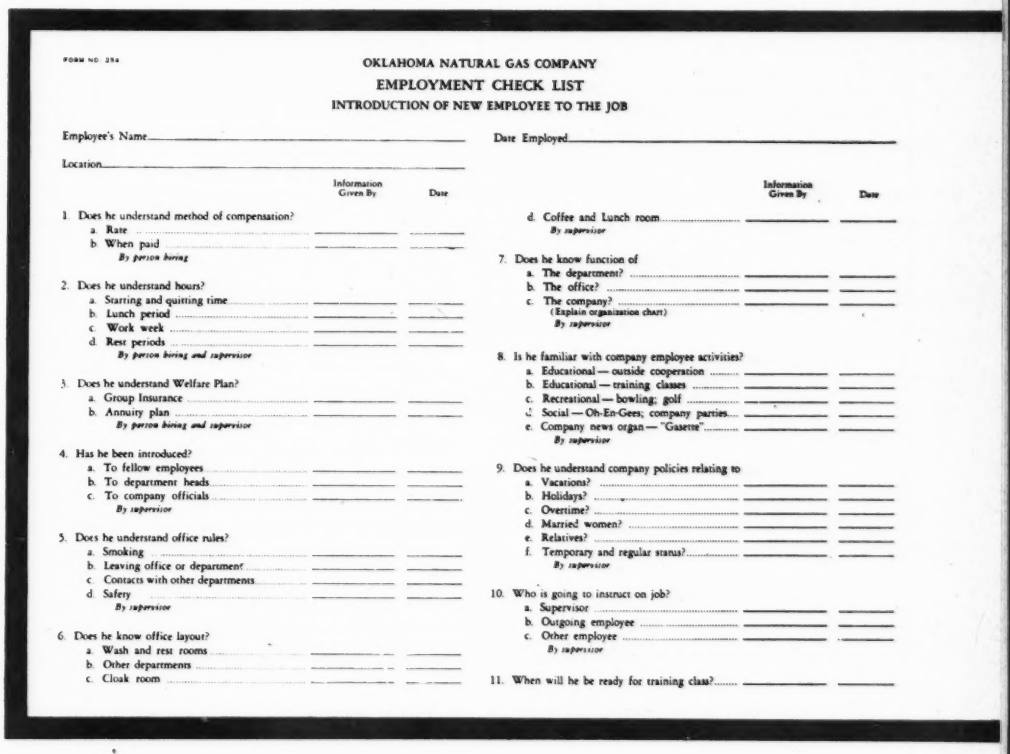
I agree that we should do something, but I doubt if we have the ability or can take the time from our daily work to put on an extensive program of economic education for our employees. I think we can be of most help in the cause by keeping our employees informed about the things in which they themselves have the greatest interest. Among these would be their present jobs, how they can qualify themselves for better jobs in the company, how secure are their jobs, and what is going to happen to them when their day of retirement arrives.

All of these things are also the concern of management so it seems to me that if we take our employees into our confidence and tell them all of our policies and problems and future plans we can satisfy them that the company for which they work *does* look out for their interests and that the system it operates under is the best in the world. This will then contribute to their political and social beliefs and those of persons with whom they come in contact, and they will then be the ones who will mold their children's thinking in the right direction.

Let us satisfy their craving for knowledge and facts. If every employer of groups, large or small, would give facts about his business to his employees, think what a far-reaching effect this would have on the general welfare of the country.

More and more companies, but not nearly enough of them as yet, are carrying on some form of such a program.

We have in our company a comprehensive program for satisfying the thirst of our employees for facts. I do not mean to say that we have all the answers, but I do feel we may be doing one or two things that other companies are not.



FORM NO. 294

OKLAHOMA NATURAL GAS COMPANY
EMPLOYMENT CHECK LIST
INTRODUCTION OF NEW EMPLOYEE TO THE JOB

Employee's Name _____ Date Employed _____

Location _____

	Information Given By	Date
1. Does he understand method of compensation?		
a. Rate		
b. When paid		
By person hiring		
2. Does he understand hours?		
a. Starting and quitting time		
b. Lunch period		
c. Work week		
d. Rest periods		
By person hiring and supervisor		
3. Does he understand Welfare Plan?		
a. Group Insurance		
b. Annuity plan		
By person hiring and supervisor		
4. Has he been introduced?		
a. To fellow employees		
b. To department heads		
c. To company officials		
By supervisor		
5. Does he understand office rules?		
a. Smoking		
b. Leaving office or department		
c. Contacts with other departments		
d. Safety		
By supervisor		
6. Does he know office layout?		
a. Wash and rest rooms		
b. Other departments		
c. Cloak room		
d. Coffee and Lunch room		
By supervisor		
7. Does he know function of		
a. The department?		
b. The office?		
c. The company? (Explain organization chart)		
By supervisor		
8. Is he familiar with company employee activities?		
a. Educational — outside cooperation		
b. Educational — training classes		
c. Recreational — bowling; golf		
d. Social — Oh-En-Gees; company parties		
e. Company news organ — "Gasette"		
By supervisor		
9. Does he understand company policies relating to		
a. Vacations?		
b. Holidays?		
c. Overtime?		
d. Married women?		
e. Relatives?		
f. Temporary and regular status?		
By supervisor		
10. Who is going to instruct on job?		
a. Supervisor		
b. Outgoing employee		
c. Other employee		
By supervisor		
11. When will he be ready for training class?		

Employee indoctrination into Oklahoma Natural Gas Co. begins at the time of hiring. An employment check list is filled out by the interviewer which indicates the degree to which the new employee has been acquainted with company function, social activities, and personnel. This information is later supplemented by educational classes and company publications.

Employment Check List

When a new employee is hired, the supervisor uses an employment check list as a guide to information he is to be given. This covers such matters as compensation, hours of work, welfare plan, office rules and layout, and other policies of the company relating to employee activities. Also included is information on vacations, holidays, and various aspects of working conditions that will enable the new employee to initially grasp some understanding of his job. The information is given to the new employee, by the supervisor, during the first two weeks of employment.

This paper was presented at the Oklahoma Utilities Assn. meeting held March 29-30 in Tulsa.

Employee Information Sessions, a series of 18 classes, are in brief: (1) introduction and a brief resume of the natural gas industry (AGA sound film); (2) how to build good will; (3) history of the company; (4) fundamentals of rate making; (5) departmental structure of the organization; (6) financial structure and operation; (7) purchasing and warehouse operations; (8) exploration and development of gas reserves; (9) drilling and production; (10) transmission pipelines, wellhead to distribution system; (11) distribution systems; (12) engineering, construction and maintenance; (13) gas measurement, field and meter; (14) customers' viewpoints on service (AGA sound film); (15) sales department and home service functions (AGA sound film); (16) safety practices; (17) welfare plans and employee activities; (18) company yards and shops inspection tour. An evaluation sheet is attached to the outline of courses to determine the interest value of each session.

Employees' Handbook

We are developing a handbook for employees that will give them more detailed information on the company's policies and working conditions. It will be presented to the new employee at the time of employment. This booklet affords reading material that will fill the gap between the date the verbal information is given by the supervisor and the period when the more detailed employee information course is given, which is about six months.

This handbook will be patterned after *Life* magazine with a maximum of illustrations and a minimum of words.

Employee Information Course

When an employee has been with the company six months, he is enrolled in an orientation course which consists of 18 lessons of one hour duration. Two lessons are held each week on company time. These lessons are conducted by department heads or qualified employees or, in the districts, by qualified district personnel comparable to general office department heads.

The course is taught through the use of slides and strip film records which have been prepared from company operations. These sessions cover an explanation of the functions and duties of each department in the company and are given for the purpose of better acquainting the employee with all company functions. Thus the employee will have a better understanding of company activities, and therefore a greater appreciation of his own job.

In addition to this course, we furnish a textbook for future study entitled, "Serving Natural Gas."

Report to Stockholders

In order for our employees to be informed about the operations, financial stability and progress of our company, we mail to each employee at his home address a copy of our annual report to stockholders. This report is mailed to the employees about three or four weeks in advance of our annual fall information meeting.

Fall Information Meetings

During November each year we hold a meeting with all employees and their wives and husbands in each district for the purpose of reporting on the progress of company operations for the past year and discussing and outlining plans for the future. Another objective of this meeting is for officers and employees to get better acquainted. The meeting begins with a dinner, after which the officers and department heads outline the progress and the plans of the company.

This is done in various ways from year to year. We began by having each department head deliver a short talk on his department's activities, using slides to illustrate them. In subsequent years we have used a panel form, with our president acting as moderator. During other years we have used quiz programs in which we presented prizes of silver dollars to employees who could best answer questions about company operations. The information used was contained in our annual report, in the monthly house organ, and also on large charts displayed throughout the dining room on the night of the meeting.

During the last meeting, we used the forum type of meeting with questions from the audience. In this procedure we also paid silver dollars for questions. A bonus was also paid if an alarm clock, several of which had previously been set at intervals, rang during the time the answer was being given.

At one of our fall meetings, we presented a film that the company developed entitled, "Pipe Dreams Come True," This was a movie on the history of our company and illustrated what it takes to find the gas and bring it to the customers' burner tips. The movie was taken from actual scenes of our company's operations.

At the last fall information meeting, we explained the necessity of requesting a rate increase in the near future. We told the employees that we expected to make an appearance before the corporation commission to ask for an increase, and we explained our position through the use of slides.

Special Information Meetings

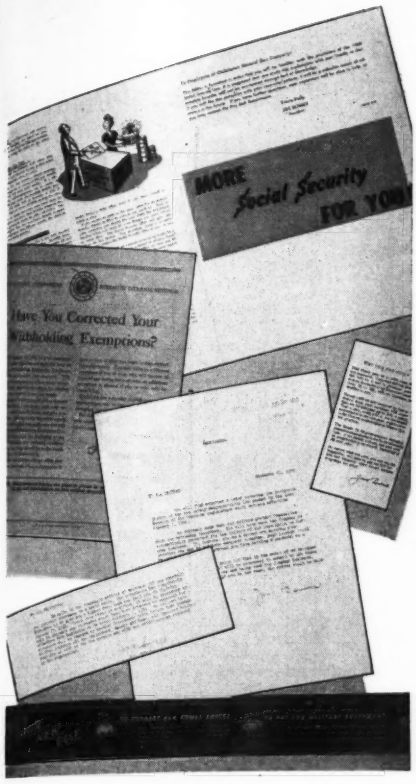
From time to time we pass information on to our employees when special occasions arise, such as the attempt of the legislature to place an additional tax on the service of natural gas. This information was put in a brochure and was discussed in meetings so that they would have the information available for explanation to their neighbors and other customers.

Another illustration of how we told the facts to employees was our action in connection with the recent cold snap in Oklahoma, where a so-called gas "shortage" developed when the demand for gas exceeded our pipeline capacity. In his application before the corporation commission of Oklahoma, our president explained the company's position in curtailing certain large industrial customers. This explanation was set forth in a letter which was mailed to all employees so that they would be informed of the company's position in this problem. Inasmuch as it was in the newspapers for a period of about two weeks, it was essential that employees have the complete story to tell their neighbors, friends, and customers.

Special Mailing Material

Other special notifications or memorandums from our president, sent with pay checks, announced freezing of salaries and wages and increases in Social Security taxes. This was also supplemented by a pamphlet published by the Bureau of National Affairs, mailed to

Two complete booklets, "Serving Natural Gas" and "Employee Welfare Plan" are distributed by the company. The former is a supplementary textbook for the information sessions and training classes. The latter illustrates two distinct welfare plans, group retirement and group life, sickness and accident, hospitalization, and surgical insurance.



Special mailing material provides information about social security deductions, state legislation, driver responsibility requirements, income tax forms and withholding tax deductions, among other items of timely interest to the employee.

employees, explaining the increase in Social Security that went into effect in 1950.

Another special consideration is for our president to send a letter to all employees, urging them to register so that they can vote. We do not tell them how to vote, but merely urge that they exercise their right to vote. Occasionally we point out certain questions of vital importance to all voters, which should be considered. We do not tell them how to vote; we suggest that they inform themselves on the issues so that they can vote intelligently. Often there are bulletins issued by impartial groups such as the League of Women Voters, and others, which discuss both the pro and con of these questions.

When the recent law pertaining to safety responsibility of automobile drivers was enacted by the Oklahoma legislature, we outlined this law and sent copies of it to all our employees.

We annually advise our employees, through the tax department, as to the requirements for filing federal and state income, personal, intangible, and real estate taxes. We remind them that requests for homestead exemptions must be filed by a specified date.

The company also publishes a monthly house organ for the benefit of the employees.

Employee Welfare Booklet

When the employee is eligible for our welfare plan, after six months of employment, the supervisor gives him a booklet describing the details of the welfare plan. This covers insurance, hospitalization, surgical benefits, dependents' coverage, and the retirement plan. The supervisor explains the plan at that time.

Reports to Management

We subscribe to a service which consists of a bi-monthly report to our supervisors entitled, "Reports to Management." These are prepared by the Research Institute of America and give up-to-the-minute information on world affairs as well as solutions to management problems.

We have an association of employees in which membership is voluntary. This association is for the purpose of discussing mutual problems of employees.

Bulletins of importance to all employees are placed on bulletin boards located in strategic places throughout the company properties.

Safety Department Activities

Under safety activities the following are provided for the employees:

1. Safety department quarterly meeting with supervisors.
2. Weekly safety meeting with employees.
3. Safety news.
4. Safety bulletins.

Training Program

The outside educational program provides company payment of 100% of the tuition in connection with courses taken at universities or business schools on subjects that are of value to the employee on his job.

Instruction in welding and in cathodic protection of pipelines is given periodically to a select group of employees.

A number of our employees attend the Gas Measurement Short Course at Norman and the annual Gas Appliance Short Course on Utilization at Tulsa university.

Our company has developed a program for instructing employees, dealers, and contractors in proper combustion, venting, gas pipe sizing, and heating.

Supervisors are taught the following: job instruction, job relations, job methods, and conference training. The first three are basic techniques on how to instruct a new employee on the job, how to develop good human relations with employees, and supervisors' job method training. Supervisors are given the conference method technique of conducting meetings which are designed for problem solving and development of certain programs.

We have a program whereby we train engineers, accountants, and sales personnel on a trainee basis—they learn the business by transferring to various jobs and mastering each of them.

Another program is for training employees in driving techniques. This includes vision testing as a requisite to good driving.

Films

Films are used in our training programs whenever they are applicable to our particular needs. We obtain films from General Motors Corp., College of the City of New York, Association Films Inc., Dallas, and other sources. We have used supervisory films on job instruction, job relations, and job methods. We have also used a number of films on safety which have been obtained from various sources. One of the finest safety films that we have had is entitled, "Miracles of Paradise Valley."

One of the best supervisory films relating to human relations between the supervisor and employee was "Strange Interview," obtained from General Motors.

At times we receive information, in answer to the propaganda calculated to destroy our American way of life, which has been prepared in a short, to-the-point manner. This we enclose with payroll checks or mail to the employees' homes.

I believe we have a responsibility to satisfy the thirst of our employees for facts about their company. By so doing we will help them to become more loyal and better satisfied with the American system.

"Oklahoma Natural Gasette," a monthly magazine featuring news of general interest, and the "Annual Report" to stockholders, which is distributed to employees, round out the company's major industrial relations programs of, by and for its employees.

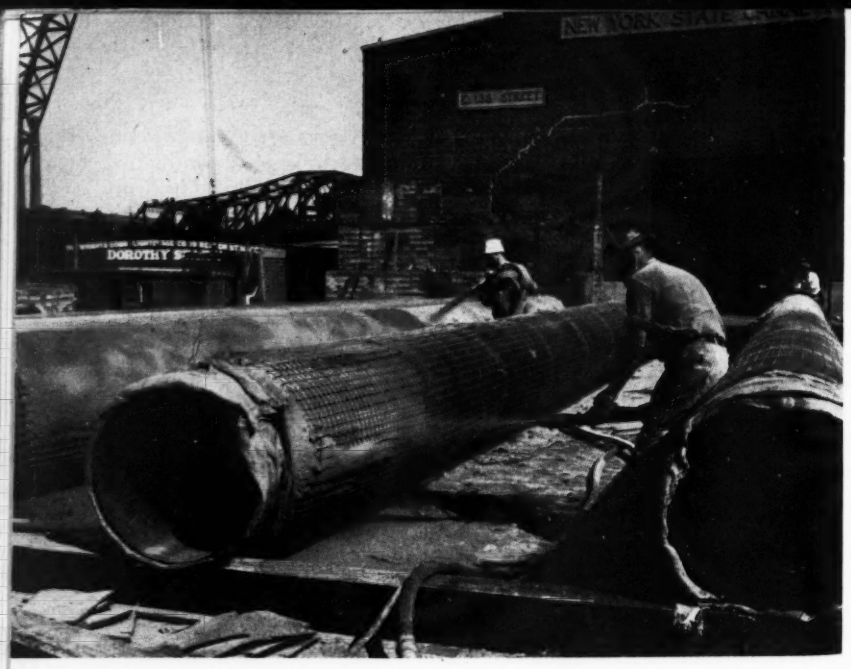


Fig. 1. Workmen apply concrete to large diameter pipe. This will add weight needed to hold pipe firmly in the bed of the river.

When to use stabilizing de

suitable for what conditions

ANCHORIN

THE tremendous increase in gas loads throughout the country has created the necessity for increasing the capacity of distribution systems. In some cases, this has been accomplished by the installation of new mains, but frequently the method adopted has been to convert low pressure gas mains for use at higher pressures. With the advent of distribution pressures ranging up to 100 psi, anchorage of mains is becoming a common rather than an infrequent problem.

The term "anchorage," as used herein, means any device or arrangement intended to prevent undesirable movement of a main or to prevent a joint from pulling apart. In the case of joints pulling apart, the term "reinforcement" would probably be more descriptive.

If the operating pressure of a main is to be substantially increased, an investigation of combined stresses in the piping system should be made, particularly with respect to bends. Should the combined stresses in a piping system be intolerable, anchorage will not help. There are many good sources of information concerning stresses in pipe and pipe bends and some of these I have listed in the bibliography. However, there is not much information readily available concerning our problem of anchorage. The bibliography lists those which have been useful to us. Properly designed anchorages or reinforcements will have little or no effect on combined piping stresses; they will merely serve as a means of keeping pipe in place.

In an all-welded line, there is no problem of joints pulling apart but in cast iron mains with bell and spigot joints or with compression couplings, and with steel mains joined with compression couplings, there are conditions where anchorage or reinforcement is required.

The investigations required to determine the necessity for anchorage are the same whether the system is cast iron or steel or whether a new system is being built or an old system is being prepared for operation at higher pressures. However, the solutions may be entirely different.

The following discussion is based primarily on investigation and experience in the writer's company in connection with increasing pressures on existing mains and the installation of high pressure distribution and transmission mains.

General Considerations

The forces or combination of forces which cause a gas main to move and hence require anchorage are internal pressure, temperature variation, and external loads. Internal pressure will tend to cause movement where the joints do not have the same strength characteristics as the pipe. Variation in temperature will cause expansion or contraction of a pipe. External forces, caused by such conditions as unstable soils, unusual street or earth loadings, or installation in swamps or river bottoms, may be responsible for the tendency of pipe to move in any direction unless the pipe is properly restrained.

Temperature Stresses

Where mains are to be installed aboveground or exposed in such locations as bridge structures or in any location where the temperature variation is large, expansion loops or joints and associated anchorages must be considered.

Fortunately, underground gas mains are operated under conditions of low temperature variation and continuous support so that we are not usually involved in the elaborate stress calculations required, for example, in power plant design. Stresses resulting from temperature differences in underground piping are rarely significant factors in so far as anchorage is concerned. Thoughout the country, the usual temperature differential to which an underground piping system is subjected rarely exceeds 30° F. On an all-welded line installed under reasonable laying temperatures and conditions, temperature stress is not excessive. On a line joined by caulking or by compression fittings, there is sufficient flexibility in the joints to compensate for any movement caused by temperature.

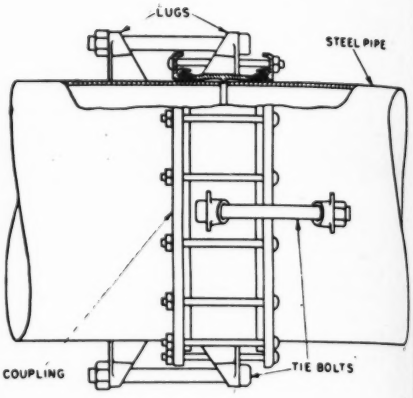


Fig. 2. Method used to prevent separation at a joint, employing a Dresser harness coupling. This arrangement still permits flexibility in the joint.

External Loads

External loading may be a factor when gas mains are installed in unstable soils, river beds, or under conditions of unusual earth and street traffic loads. Under certain conditions where settlement is anticipated, it is desirable to build a main with flexible joints to minimize pipe stresses and, in that case, consideration should be given to anchorage across the joint to limit rather than pre-

which are

AS MAINS

By EDGAR G. WATKINS
Consolidated Edison Co. of New York

vent movement. If conditions are such that the pipe may be buoyant, it may be necessary to add weight to the pipe either by the use of added weights, by increasing the wall thickness of the pipe, or by the installation of ground anchors. In the case of river crossings, consideration must be given to the fact that the buoyant effect of fluid mud or silt is considerably greater than that of water.

Fig. 2 illustrates a method used to permit flexibility in the joint and still prevent that joint from pulling apart. *Fig. 1* shows concrete being applied to large diameter pipe to add sufficient weight for the satisfactory installation in the bed of a river.

Internal Pressure

It is the effect of internal pressure with which we are most frequently concerned in revamping old systems or installing new systems at distribution pressures up to 100 lbs. In the case of a new steel main, the simplest method is to weld all joints at or within the required distance from bends. For a new cast iron main, some method of anchorage of joints at or near bends must be used. In the case of existing mains, the problem of anchorage requires devising a method to suit field conditions.

As an indication of the scope of the problem, it is probable that any system of mains 16 in. in diameter and larger and carrying 15-lb pressure or greater should be investigated for anchorage. Mains 12 in. and larger should be investigated if pressures are to be in excess of 50 psi. The necessity for anchorage frequently arises during the construction of new mains where temporary caps are installed for testing a section of the line.

It has been our experience that cast iron mains up to 20 in. in diameter can be operated satisfactorily at pressures up to 15 lb without anchors, providing clamps have been installed on the bell and spigot joints. Currently, we have in operation mains as large as 48 in. in size, with pressures as high as 7 psi, operating satisfactorily without anchorages. However, during the years, approximately 75% of these 48-in. joints have been equipped with bell joint clamps.

The highest pressure carried on cast iron bell and spigot joint mains in our system is 60 psi. The joints of this main have all been clamped and anchorages have been provided at the bends. A 24-in. compression coupled steel transmission main is in service at 100 psi; the joints near the bends are anchored. A 24-in., 250-psi, steel transmission main was recently constructed on which the anchorage problem was simplified by not using compression couplings close enough to any bend to require anchorage.

Throughout this discussion, there is no allowance made for strength and tension of either compression or caulked type joints. They have some such strength but the values are extremely variable. Manufacturers of compression couplings are reluctant to quote any values in tension for their joints. Tests we and others have made have demonstrated that caulked joints can be made which have considerable strength in tension, but the results of such tests are not consistent and the strength obtained depends upon such factors as the skill of the man making the joint, whether the joint was cast or made with lead wool, the roughness of the pipe, the design of the bell, etc. For these reasons, we consider it good practice to neglect any tensile strength of these joints where the main sizes and pressures are as discussed in the preceding paragraph. Bell joint clamps add somewhat to the ten-

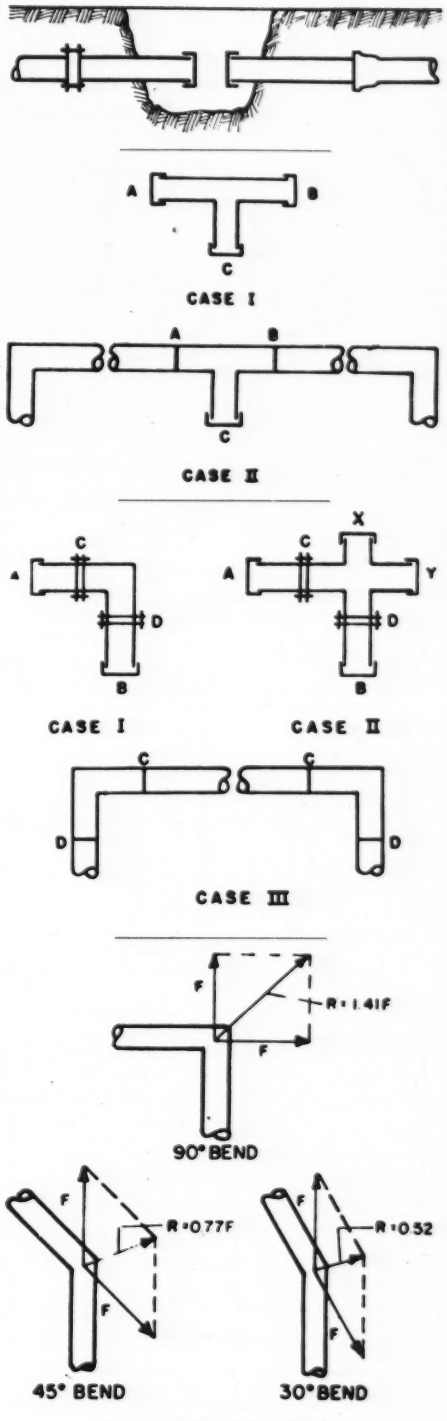


Fig. 3. (Top) Pipe capped in open trench. The cap must be securely fastened or it will tend to blow off.

Fig. 4. In Case I caps will blow off unless securely fastened. However, if fitting is inserted as shown in Case II, only an anchor at Cap C is required.

Fig. 5. In Case I if internal pressure is applied to the tee, the balance in pressures in the fitting will prevent movement. In Case II, Caps C and D and joints beyond these locations must be anchored.

Fig. 6. Illustration of the principle of why a 90° bend requires the maximum anchorage with less being required for bends of smaller degree.

Fig. 7. Offsets in the line require anchorage as illustrated.

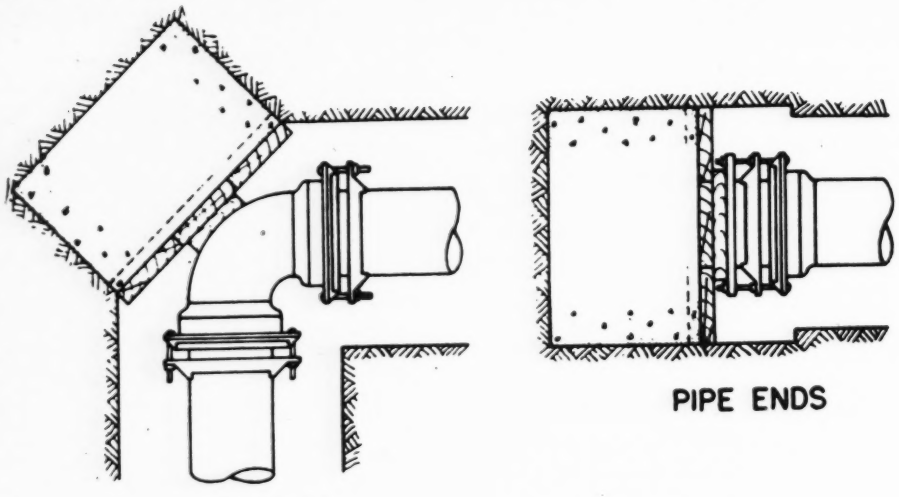
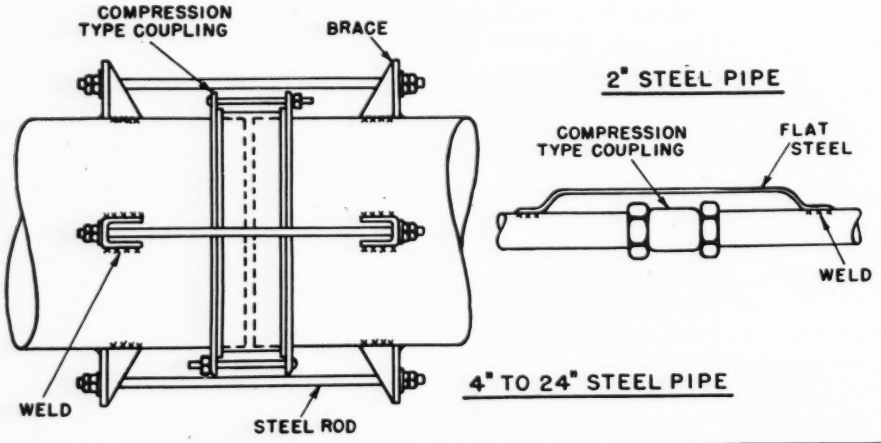


Fig. 8. Two methods of anchoring with concrete.

Fig. 9. Where compression fittings are used within prescribed distances from bends, anchorages are specified. Degree of bend and size of pipe determine proper distances as indicated in the chart. Also shown are anchorages for compression-type coupling steel mains at 100 psi.



STEEL PIPE SIZE	NUMBER OF RODS	DIAMETER OF RODS	ANCHORAGE SHALL BE APPLIED TO COUPLINGS WITHIN THE DISTANCE SPECIFIED FOR THE FOLLOWING FITTINGS			
			DEAD ENDS	60° TO 90° BENDS	30° TO 59° BENDS	OFFSETS
2"	1	1¼" x ¼"	20'	—	—	—
4"	2	⅝"	30'	30'	—	—
6"	2	¾"	50'	50'	30'	30'
8"	2	¾"	50'	50'	30'	30'
10"	2	¾"	50'	50'	30'	30'
12"	2	¾"	50'	50'	30'	30'
16"	4	1"	50'	50'	30'	30'
20"	4	1"	50'	50'	30'	30'
24"	4	1"	50'	50'	30'	30'

Table 1. Theoretical Embedment Length to Counteract End Thrust

Pipe Size	Cover	Pressure	End Thrust	Frict. Resist.	Embedment
12"	4'	50	5,650	300	18.8'
		100	11,300	300	37.7'
20"	4'	50	15,700	450	35'
		100	31,400	450	70'
24"	4'	50	22,600	510	44.5'
		100	45,200	510	89'
30"	4'	50	35,350	650	54.3'
		100	70,700	650	109'

sile strength of the joint, but here again the value is extremely variable.

End Thrust. It is generally recognized that if we cap the end of a pipe under pressure, the cap must be securely fastened or it will blow off (see *Fig. 3*). The force or end thrust tending to blow off the cap is equal to the area of the pipe end multiplied by the pressure; in the case of a 12-in. cap under 50-psi pressure, this force is 5650 lb—nearly 3 tons of pressure. If the cap is welded to a main, the force necessary to keep the cap in place is carried into the main. This force will induce a unit stress in the end wall of the pipe equal to the end thrust divided by the wall area of the pipe and, for a 12-in. pipe with a ⅜-in. wall thickness, amounts to the relatively low figure of 423 psi. Likewise, to anchor a compression cap under similar circumstances by means of bolts would require a bolt cross section area of only .314 sq in. However, to block the cap against the end of the trench would require blocking to support nearly 3 tons. Similarly, at 50 psi, to keep a 24-in. cap in place requires blocking to support over 11 tons.

For every force exerted, there must be an equivalent reacting force. Factors which prevent a pipeline from pulling apart are the tensile strength of the joints and the resistance of the pipe to movement in earth. If the line is solidly welded, the entire length of pipe will resist the tendency to move. If the line is joined with compression couplings or caulked joints, it may be necessary to anchor several of the joints to make a total length of embedment which has sufficient resistance in the earth to prevent movement. An alternative to this type of anchorage will be to install an anchorage at the bend to support an end thrust. In the case of the 12-in. cap under consideration, the end thrust is 5650 lb.

The fundamental expression for determining the length of embedment of pipe involves the size of the pipe, external loads, depth of cover, weight of pipe and fill material and is expressed as shown at the bottom of the next page.

The coefficient of earth friction for average granular materials is assumed at 0.30 to 0.35.

Based on the values reported by Rus-

sell E. Barnard,[1] *Table 1* has been prepared to indicate the length of steel pipe which must be embedded to prevent pipe movement caused by the end thrust on an end cap. Later in the discussion, we shall show that this embedment distance is also required on each side of a 90° bend.

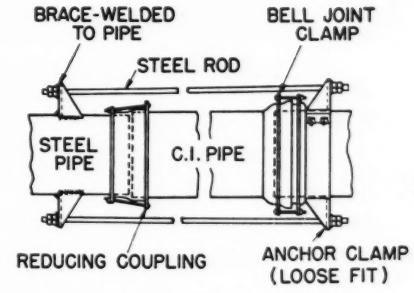
It can be seen from *Table 1* that the 12-in. pipe must be embedded in approximately 19 ft of solid earth to overcome the tendency to move. *For a newly back filled trench, the resistance of the earth may be as low as one-third* of the 300-lb value and the required distance would probably be closer to 60 ft.

In a determination of anchorage requirements, the character of the soil is important. Accurate information as to the friction values between pipes and soils of various kinds is not readily available, and this information must be used with considerable caution. Conditions usually vary considerably throughout the length of any one main. For this reason, if a line is to be anchored, general conclusions can be reached in advance of the job but an engineering inspection should be made at each location to determine whether the general design is adequate.

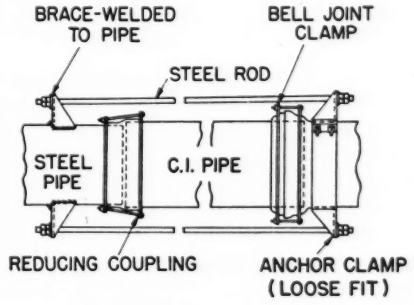
In the foregoing, we have considered the simplest case of necessity for anchorage. The tendency for a pipe or fitting to move depends upon its position in the piping system. In the case of a tee capped at all three ends, we know from experience that when internal pressure is applied to this fitting, there is no tendency for the fitting to move. It will not move because pressures are balanced in every direction.

However, we also know from experience that unless Caps A, B, and C (Case 1, *Fig. 4*) are securely fastened, they will blow off. However, if this fitting is inserted in the line as in Case 2, *Fig. 4*, the only necessity for anchorage is at Cap C because there is no end thrust acting on the horizontal joints.

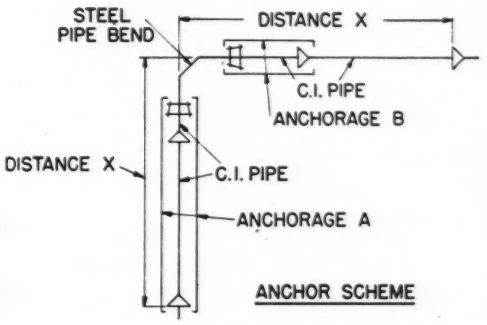
For a right angle bend (*Fig. 5*, Case 1), we know that, similarly, if we apply internal pressure to the tee, there will be no tendency to move because the pressures in the fitting are balanced. However, Caps A and B and Joints C and D must be anchored. This is better seen if we assume that the bend is constructed as in Case 2. It is obvious that there is an end thrust against Caps X and Y,



A. STEEL TO CAST IRON PIPE-SPIGOT END.



B. STEEL TO CAST IRON PIPE-BELL END.



ANCHOR SCHEME

FITTING	MINIMUM LENGTH OF ANCHORAGE INCL. ONE BELL
	DISTANCE X
60° TO 90° BEND	25'-0"
30° TO BUT NOT INCL. 60° BEND	20'-0"
BENDS BELOW 30°	0 & INCL. FIRST BELL

Fig. 10. Schematic sketches showing the anchoring of steel pipe to cast iron main on 20-in. diameter gas mains.

which must be counteracted by thrusts at Cap A and B, and that C and D must be anchored to prevent those joints from pulling apart. Case 3 illustrates a right angle bend in a line, in which case Joints C and D and joints beyond those locations must be anchored to provide a sufficient length of anchored pipe to resist the end thrusts at the bend. This anchored, or embedment, distance can be determined by the same method described for end caps.

It is the general practice not to install bends of greater than 90° and, with this premise, a 90° bend requires the maximum anchorage. Less is required for bends of smaller degree. Reference to *Fig. 6* will illustrate this fact. For a Force F acting in the direction of the pipe axis resultant forces are:

For a 90° bend, R = 1.41 F
For a 45° bend, R = .77 F
For a 30° bend, R = .52 F

Studying the direction of the forces for bends of less than 90°, it is obvious that forces offset each other to some extent.

Fig. 7 illustrates the need for anchorage at offsets in the line. If there is a joint between the bends in the offset, it must be reinforced unless the bends themselves are anchored. If the anchorage is done only at the joints, all joints adjacent to the bends must be anchored.

Methods of Anchorage. The most obvious means of anchoring a bend against end thrust is to encase the bend or abut it to a block of concrete. When it is considered that the end thrust on a 90° bend in a 12-in. pipe carrying 100-lb pressure is approximately 15,930 lb, it is apparent that the size of the concrete structure required becomes formidable. If the concrete block can be installed with allowance for spreading the load to the surrounding soil, the size is still impressive. However, in city streets where excavations are likely to be made immediately adjacent to such an anchor, it is not usually safe to depend upon spreading the load in this fashion.

Fig. 8 illustrates some methods of anchoring with concrete. Some companies have had experience with the use of concrete blocks with steel rails embedded and used as piles. For a metropolitan area, such as New York, concrete anchorages are not deemed practical. Other methods have been adopted; these will be described later.

Current Practice

Consolidated Edison Co. is engaged in installing distribution mains ranging from 2 in. to 20 in. in size for distribution pressures as high as 100 psi. During the past few years, we have constructed mains up to 30 in. in size for pressures as high as 350 psi. We have also had occasion to recondition a

[1] "Design Standards for Steel Water Pipe," *Journal*, American Water Works Assn., January 1948.

Formula for Determining Embedment Length

$$\frac{\text{End Thrust}}{(\text{Earth Load} + \text{Weight of Pipe}) \times \text{Coefficient of Earth Friction}}$$

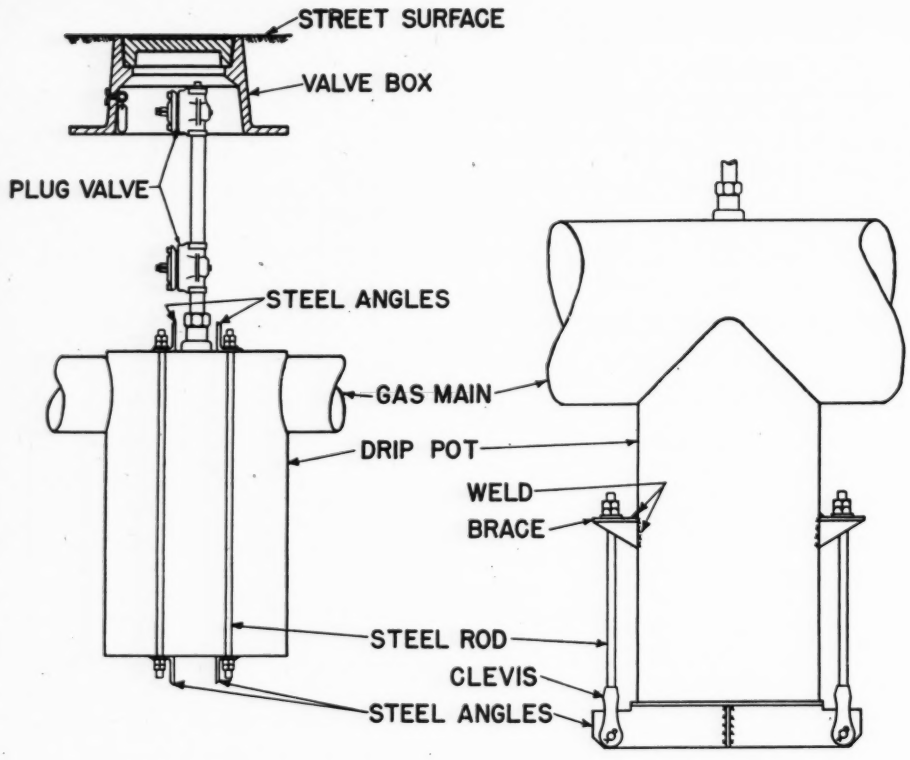


Fig. 11. Method of reinforcing existing drip pots for higher operating pressures.

20-in. cast iron main, originally designed for operation at low pressure, for operation at 60 psi. A 24-in. transmission main was also reconditioned for operation at 100 lb after having been operated for more than 20 years at pressures not exceeding 15 psi. A brief description of our current practice and our method of reconditioning transmission mains will illustrate our application of the principles involved in anchorage or reinforcement of bends and joints.

For routine construction of high pressure distribution mains (100 psi maximum) in sizes from 2 in. to 20 in. inclusive, welding or compression couplings are used at the option of the construction forces. Most often, the mains are a combination of both joints. Where compression fittings are used within prescribed distances from bends, anchorages are specified. These distances depend upon the degree of the bend and the size of the pipe. (See *Fig. 9.*)

Extensive use is made of insulating joints—all of the compression type. When they are to be used within a restricted distance from a bend, the anchorage is also insulated.

In the case of cast iron lines, revamped for operation at pressures in excess of 15 psi, we have generally replaced the bends with welded steel pipe and anchored the steel pipe to the cast iron sections by means of pipe clamp anchors.

The question frequently arises as to the necessity for installing anchorages around valves. In our case, we have not provided such anchorages because the only danger involved would be in the case where a cutout was to be made immediately adjacent to the valve. In such a case, this line would be useless for transmission purposes during the cutout and the pressure in the line would be reduced so that anchorage would not be required. Anchorage, if required, is installed at the time of the cutout.

The 350-psi natural gas mains recently constructed were of all-welded construction except for compression type insulating joints. An attempt was made to keep these joints as far as possible from bends; nevertheless, insulated anchor rods were installed across the joints to prevent their pulling apart.

A brief description of recent reinforcement work is presented as an illustration of methods which have been used for anchoring mains.

Increasing Pressure on a 20-In. Cast Iron Main. It was proposed to increase the operating pressure to 60 psi on a 20-in. ID cast iron bell and spigot main installed in 1922 and originally intended for operation at 20 in. w.c. pressure. In 1930, the pressure on the line was raised to 15 psi and those joints which had not already been clamped were clamped at that time. Our investigation, based on the wall thickness (0.68 in.) and the cover over the main, indicated the following:

1. The barrel of the gas main was adequate for 60 psi with a factor of safety of 2.
2. The factor of safety in the bends was considerably lower and, considering the age of the main, probably unduly low.
3. The longitudinal stress at the bends was such that anchorage would be required.

The following methods of anchoring fittings were considered:

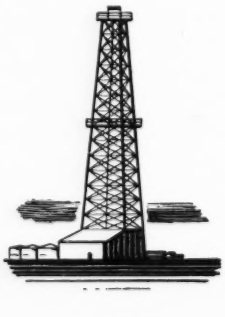
1. A block of concrete in back of the bend.
2. Concrete encasement of the entire bend.
3. Block of concrete at inside of bend to which pipe is tied.
4. Attach bend to external anchors other than concrete by means of bands, clamping the pipe.
5. Anchor a sufficient length of pipe to obtain required embedment for end thrust.

For reasons already discussed, concrete anchorage or encasement was not used. Steel braces cannot be attached directly to the cast iron pipe, so friction clamps would have been required if the stress were to be uniformly distributed into the pipe itself. The calculated stress set up within the pipe walls by this means was excessive.

Since the pipe could be out of round and the clamp likewise, it is evident that serious difficulties would be encountered. An expanding type of anchor with a guy attached to the pipe, unless placed in undisturbed soil, would move an appreciable distance while the soil was being made compact. In addition, the same objection applies to this method as for the concrete anchor. Should the soil be disturbed by future excavations, the anchorage will be lost.

The only satisfactory method appeared to be one in which the force would be transmitted along an anchored distance sufficient to obtain the required embedment of the main (Method No. 5 above). We were not able to develop to our satisfaction a method of anchoring the 90° cast iron fittings to the cast iron pipe. Because of the brittle nature of the cast iron and the relatively high stress in the bend itself, it was decided to replace those fittings with fabricated steel. *Fig. 10* illustrates schematically what was done. Generally, the method consisted of tieing together the bends and joints with rods for a calculated distance from the bend to be anchored.

The minimum tie-back distance was calculated as approximately 25 ft. The resistance to sliding offered by the bell of the pipe joints should make this estimate a conservative one.



Increasing Pressure on a 24-In. Steel Main. A second example of a reinforcement and anchorage problem was the preparation for operation at 100 psi of a 24-in. OD gas main originally installed in 1928 and operated at a maximum pressure of 15 psi. It was constructed of steel pipe having a wall thickness of ⅜ in. except through a swampy area and in a tunnel beneath a river where ½-in. wall thickness pipe was used. The existing fittings, tees, drip pots, and ells were fabricated by means of riveting and were ½-in. wall thickness. All of the joints were of the compression type except for flange type valves and insulating joints.

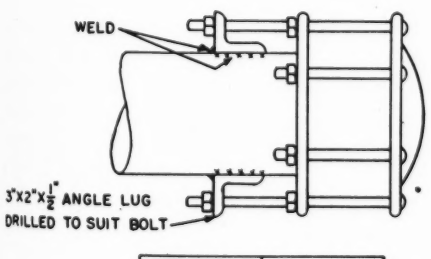
The following items pertinent to this discussion required reinforcement for the proposed higher operating pressure:

1. Bends less than 45°: The compression type couplings were anchored for a distance of at least 35 ft on either side of the bend. (See *Fig. 9.*)
2. Bends of 45° to 90°: The compression type couplings were anchored for a distance of at least 60 ft on either side of the bend.
3. Drip pots: These were reinforced. (See *Fig. 11.*)
4. Dead end tees: These were also reinforced.
5. In the tunnel: The bases of the risers in the tunnel shaft had been adequately anchored during the original installation. Compression fittings throughout the tunnel were anchored as a precautionary measure against the possibility of the tunnel being flooded and causing the pipe to move.

Combating Temperature Variation

An unusual problem in anchorage developed out of the installation of a 24-in. 350-lb line on a bridge where the line was designed for a temperature variation of approximately 150°. This required the installation of expansion joints. However, with the installation of the expansion joints, it would be necessary to anchor the bends at the bridge approaches. The end thrust, 247,000 lb, was such that an anchorage was impractical.

Fig. 13. Method of anchoring line cap to steel main at maximum pressure of 100 psi.



SIZE OF PIPE (INCHES)	NO. OF LUGS REQUIRED
2 & 3	1
4,6,8,10,& 12	2
16	3
20	4
24	5

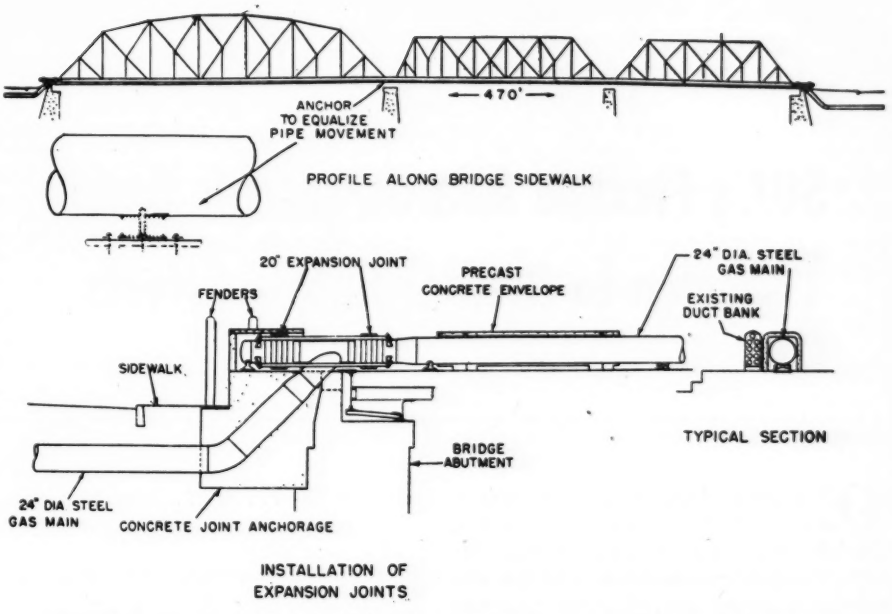


Fig. 12. Use of double expansion joint eliminated necessity for anchorage of bends at bridge approaches. End thrust of 247,000 lb made ordinary anchorage impractical.

To eliminate the necessity for such an anchor, the installation shown in *Fig. 12* was installed. This makes use of a double expansion joint, one on either side of the take-off so that end thrusts are carried into the pipe itself and the only anchorage required is that sufficient to overcome the resistance of the expansion joints themselves, approximately 6000 lb.

Combating External Forces

Another recent problem involved the installation of a 30-in. OD, ½-in. wall pipe across the Harlem river (see *Fig. 1*). Sufficient weight to keep the pipe in place was obtained by coating the pipe with 3½ in. of reinforced concrete. It was estimated that the displacement weight for fluid mud in the river bottom at this location was approximately 110 lb per cu ft. It was necessary that the pipe be heavy enough to overcome this uplift.

There was recently a case where anchorage interfered with the proper operation of a main. A 42-in. steel main joined by compression couplings was installed across filled land near the river. Originally, the main had been installed on piles aboveground. Later, with the land fill operations, the main was covered and steel bents were installed to prevent the main from floating in the soft fill. During the course of the years, the original supporting piles and the subsequently installed steel bents were both badly damaged. This condition was suspected when elevations on the main showed that it was badly trapped in several locations. The solution in this case consisted of removing all restraint from the pipe and permitting it to accommodate itself to slight movements, which are still taking place in this area. Since all supports and restraints have been removed, no traps of any importance have developed. During all this experience, there were no leaks in the main.

Mr. Watkins, division engineer for the New York utility, presented this paper before the AGA distribution conference in Memphis April 16-18.

Conclusion

The methods described in the foregoing discussion are those used in the writer's company. The problem of anchorage or reinforcement is difficult to standardize because of the large number of variables such as kind and size of pipe, character of soil, internal pressure, external forces, and temperature conditions. The fact that there are so many variables means that there are many solutions. It is hoped that those herein offered are of some value.

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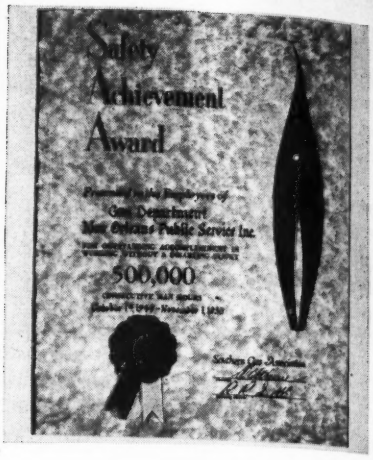
SGA's Flexible Award Program Spurs Gasmen to Greater Safety Efforts



By ARTHUR J. NAQUIN
Safety Counselor
New Orleans Public Service Inc.

ON Friday, Jan. 26 of this year a very special event was celebrated in Mobile, Ala., at a joint luncheon of the accident prevention group and the employee relations section of the Southern Gas Assn. The first of the new SGA Safety Achievement Awards were presented to representatives of the first four gas companies able to qualify.

SGA has had under consideration since September, 1949, the establishment of a new form of recognition to be given to member companies achieving outstanding employee accident prevention records. At a round table conference of the accident prevention committee held at that time, the desirability of creating a new form of safety incentive was thoroughly discussed. The experience of the transit industry with its newly established Employee Safety Achievement Award was reviewed.

There was conclusive evidence that when recognition is given to employee groups for having attained goals of 250,000 and 500,000 man-hours worked without a disabling injury it tends to spur them on to even greater group effort. On the other hand, it was pointed out that when goals are set too high it tends to destroy the incentive to reach them. For example, many small properties would have to operate from five to ten years to accumulate a total of 1 million man-hours. Experience has shown that when it takes that long to build up an accident-free record, it is difficult to sustain employee interest in the record while it is growing. As a result of these discussions it was agreed that the accident prevention committee would recommend to the employee relations section of SGA the appointment of a special committee to work out the details for a proposed safety achievement award plan for the Southern Gas Assn.

On Aug. 3, 1950, Chairman Curtis M. Smith of the employee relations section asked the writer to serve as chairman of the above named special committee and designated W. A. Allred, Lone Star Gas Co.; Stan Downey, Southern Natural Gas Co.; M. V. Smith, Oklahoma Natural Gas Co.; R. H. Spikes, West Texas Gas Co.; Jimmie Walker, Arkansas Western Gas Co., and W. B. Wood, Rio Grande Valley Gas Co., as the other committee members. This group met in New Orleans on Sept. 14 along with V. H. Luneborg, Arkansas Natural Gas Corp., and R. R. Suttle, SGA's managing director, and reached a unanimous agreement on rules and procedures.

In brief, four awards were proposed: A Certificate of Achievement for the completion of 100,000 consecutive man-hours without a disabling injury (to be awarded primarily to very small gas companies, or to departments, divisions, or other units of medium and large size properties), and Certificates of Achievement based on 250,000, 500,000 and 1 million consecutive man-hours of operation also worked without a disabling injury. The definition of a disabling injury—or lost-time accident—is that recognized by the American Standards Assn. and the National Safety Council. Applications must be signed by a responsible official of an SGA member gas company.

On Dec. 1, the SGA board of directors approved without change the entire safety award plan and authorized it to go into effect on Jan. 1, 1951. On Jan. 26, Lone Star Gas Co. and New Orelans Public Service Inc. had each qualified for and received a 500,000 man-hour certificate, and the Gas Light Co. of Columbus (Ga.) and the Augusta Division of the Atlanta Gas Light Co. each received a 250,000 man-hour certificate. Man-hours accumulated prior to Jan. 1, 1951 were recognized in each instance, since each company's safety record was intact as of that date.

Said SGA President Carl A. Horne's letter of transmittal: "You and your associates may well be proud of your achievement for, to me, it signified that in our American way of life we do put a high value on safeguarding the life and limb of the individual. I sincerely hope that the earning of this award will inspire all of you to check even more carefully into your daily work practices. Accident prevention work requires a systematic review of everything we do, and when it is conscientiously done it reaps its own rewards."

Shown at joint luncheon held in Mobile, Ala., by accident prevention group and SGA employee relations section are E. E. Edmondson, Texas Eastern Transmission Corp.; J. H. Collins, New Orleans Public Service Inc.; Jack M. Averett, Gas Light Co. of Columbus, Ga.; W. A. Allred, Lone Star Gas Co.; B. R. Hendrix, Atlanta Gas Light Co.; and Curtis M. Smith, Tennessee Gas Transmission Co.

GAS STORAGE ACCOUNTING

By A. A. CULLMAN

Investment in gas storage inventory has become a major item on gas company balance sheets. Soon deposits may total 1 trillion cu ft, with daily withdrawals reaching 3 billion. Five basic problems of accounting must be met if management, investors, and auditors are to be satisfied with the way this unseen asset is shown on the company's books.

THE demand of distant markets requiring large quantities of gas from the southwest fields has so multiplied the economic advantages of storage operations, through improved load factors, that underground storage has become a major consideration in the natural gas business.

The steady increase in financial importance of gas storage operations is related not only to the obvious economic advantages but also to the dollars invested in storage inventory.

In our own Columbia Gas System, if present plans materialize, investment in gas storage inventory within two years will become the second largest item on our balance sheet, exceeded only by the value of physical property. Large storage inventory investments appear in the balance sheets of other systems.

Naturally an item of such magnitude on the balance sheet of any company gets a lot of attention from its management, its independent auditors, and the investors in its securities. Numerous questions must be answered.

Summed up, the combined approach of these various interests might be stated somewhat as follows:

"Yes, we know there is gas in the fields. There has to be. It comes out in the winter, doesn't it? But do the fields still hold all the gas your balance sheet shows as inventory? How do we know it is there? Will it be recovered?"

This combined approach may be resolved generally into five basic problems. These are:

1. The safety of the gas in the storage field.
2. The periodic determination of the quantity of gas in the storage fields.
3. The recording of all gas removed from the storage fields by withdrawal for market or in any other way.
4. The segregation of the storage inventory between fixed capital and current assets.
5. The segregation of storage expenses from other operating expenses of the enterprise.

Mr. Cullman, assistant treasurer of Columbia Engineering Corp., New York, presented this paper at the AGA Natural Gas Department spring meeting in Dallas, May 7 and 8.

The first question is "How safe is the inventory?"

There is no longer any doubt within the industry that the gas in underground storage pools is perfectly safe, except under unusual circumstances surrounding specific pools, such as water encroachment. If any doubts did exist at an earlier date in a few quarters, the expansion of such operations in the last decade is ample evidence that such doubts have been resolved. The following is quoted from a recent report by E. E. Roth, chief geologist of Columbia Gas System.

> Once the field has been selected and secured, and found by study to be a closed sand reservoir and if all of the wells are properly equipped, there can be no appreciable loss of stored gas and, furthermore, native gas in varying amount, acting as a safety factor, is still present in the reservoirs. Furthermore, these reservoirs held the original gas for almost countless ages and no change has taken place that would alter the physical reservoir in any way except the drilling of wells into it . . . There is every reason to believe that if the casing and tubing of wells in the storage fields have been properly cemented and packed, the pressures in the sand could be raised substantially above the original . . .

Discussions with other geological and operating personnel have indicated similar belief.

Convincing the Investor

Yes, within the industry we have assured ourselves that the gas inventory is safe. But the investment in stored gas is growing and the ownership of natural gas securities is widespread. The factors which have convinced those within the industry that our underground savings banks are safe today, and will continue to be so, must be presented in the most effective manner for the benefit of investors, bankers, and auditors who are not as familiar with natural gas operations as we are.

That is one of the operating aspects of gas storage accounting: The development by operating personnel of all possible data confirming the safety of the gas in the ground.

The second point has to do with the periodic determination of the quantity of gas in the storage fields. Geologists have been making estimates of the volumes of gas in the native gas fields for a good many years. The results to date have generally proven such estimates reasonably sound.

However, the recovery of gas in a native gas field has a cost relationship only to the dollars invested for leaseholds and wells, and this investment is written off as the native gas is removed. This removal happens only once. In the case of a field with, say, 10 billion cu ft of native gas and a property cost of 6 cents per Mcf, the investment in the field would approximate $600,000. That is the sum total of the money which must be recovered with the exhaustion of the gas.

Compounding An Error

Let us take the same field and convert it to storage with an annual input and output of 3 billion cu ft. If this is southwest gas carried to distant storage fields, it would probably cost about 20 cents per Mcf. If the field is used for 30 years with that annual input and output, 90 billion cu ft will move in and out of the field and the gas handled by it will cost $18 million or more. It can readily be seen that the compounding of a minor error over that many annual turnovers can add up to a sizeable sum of money.

This illustrates, I believe, the importance of the development of the very soundest methods for computing the volume of gas in our storage inventories. This is true, notwithstanding the added difficulties of making such determinations because of variations in input or output conditions in advance of rock pressure readings, such as additional well drilling, well cleaning, length of resting period, and others.

With so many dollars involved, our auditors must have maximum assurance to aid them in certifying our statements, and those who invest in our securities are entitled to similar assurance.

Therefore, close attention should be paid to the development of the best methods of determining the volume of stored gas actually in a given pool at a given time, and operating personnel should gear their use of the fields in such a manner that they are available periodically for the making of such determinations. It is not enough to merely show that the average rock pressures in a pool are so-and-so or that the delivery from the field per pound lost in rock pressure is so much, unless the net result is the development of an inventory figure in Mcf which can be matched within reasonable limits with the inventory shown on the books.

That is another of the operating aspects of gas storage accounting: The development of the best methods of determining the volume of gas in each of the storage pools as of given dates.

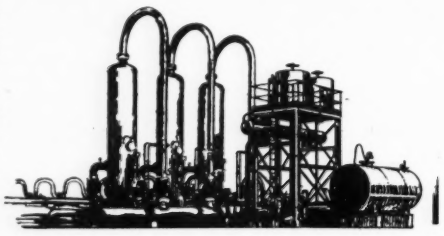
12 Ways to Lose It

The third point has to do with the recording of all storage withdrawals or losses. A recent survey indicated not less than 12 ways gas might leave a storage field other than through a correctly measuring meter. There are probably others not in the list. All of these 12 ways are of such character that the loss or use is known by the operating personnel as it occurs, and the volume can be measured or accurately estimated.

Assuming the development by the geologists of the very soundest methods of determining the volume of stored gas in a pool, companies with extensive storage operations may be faced with some pretty substantial periodic inventory adjustments if these losses or uses are not recorded as they occur. The list includes:

1. Blowing wells and drips.
2. Gas used by free gas customers in storage areas.
3. Gas used by pay gas customers in storage areas.
4. Gas lost in drilling.
5. Gas used in drilling.
6. Well or line blowups.
7. Gas lost in repairs to wells.
8. Inaccuracies of measurement.
9. Filling and purging lines connecting new wells and lines.
10. Opening frozen lines.
11. Loss of gas from storage fields to company owned producing wells and not accounted for as storage.
12. Gas used by storage compressor stations in back of the measurement meter.

There are other types of losses, such as line loss or well leakage, which may not be determinable as they occur. These we may have to make inventory adjustments for as inventories are taken. However, the amount of such adjustments can be minimized, and the balance in storage as of any given date more accurately stated, if known losses or uses are accounted for as they occur.



To accomplish this, operating personnel should carefully report known losses or uses currently, and the volumes involved should be recorded as withdrawals of the gas.

This is a third operating aspect of gas storage accounting: The current identification and reporting of known losses or uses of gas from the storage inventory.

As of the first of 1951 FPC adopted some revisions of its "Classification of Accounts," the principal change being the inclusion of accounts and instructions for underground gas storage. The instructions for the inventory account include the following:

> As of the balance sheet date this account shall be segregated so that there shall be retained in this account only such amount as represents cost of gas appropriately classifiable as a current asset according to conventional rules of classification of current assets, not exceeding the estimated withdrawals of gas from storage for purposes of sale within the succeeding 24-month period from the date of the balance sheet.

The intent of this provision is amply clear: The gas storage inventory shall be divided between that part which is to be removed currently and that which it is intended shall be left in the ground for pressure purposes, usually referred to as cushion gas. Although some companies have been following this practice on their own for a year or two, the regulation is so new that some will be faced with the problem for the first time this year.

Classifying Cushion

The classification intends that the inventory cost of the gas representing the base volume or cushion shall be transferred to fixed capital. The cost of the remaining volume which it is expected will be available for current delivery is to be retained in the current asset accounts.

In a substantially depleted field which is converted to storage operations, the cushion will consist of stored gas to a large extent.

In a pool which is only partially depleted when devoted to storage, stored gas may constitute only part or none of the cushion.

It is the job of the operating personnel to advise the accountant as to the proportion of the total stored gas inventory which should be transferred to fixed capital. In developing a recommendation it is strongly urged that an allowance be made for abnormally heavy withdrawals so that the balance retained in the current asset category will be sufficient to handle the winter's delivery without encroaching on the volumes which have been transferred to fixed capital.

This is a fourth operating aspect of gas storage accounting: A careful approach by the operating personnel as to the segregation between current and cushion gas in the storage inventory.

Storage or Non-Storage

The fifth and last point involves the segregation of operating expenses between storage and non-storage. This point does not involve any action on the part of the operating personnel. Instead it has to do with explaining the thinking in back of some accounting policies which operating men occasionally complain about.

The terms of the revised FPC classification provide that the only property which shall be considered as storage plant is that which is used wholly or predominantly for the storage of gas. The terms of the expense accounts provide that the only expenses which shall be treated as storage expenses are those incurred in operating these storage plant facilities, and none of the costs of getting the gas to the storage fields shall be so treated.

The usual complaint runs something like this: "Well how is that fair? I am operating my compressor stations (substitute transmission lines if you wish) all summer long pumping gas to storage, yet I am charged with the whole cost. Why isn't that a storage expense?"

That is a logical question; however, it does call for a little analysis. During the several years that the cushion in a storage field is being established, maximum justice would probably dictate that the company should be relieved of some of that cost. Cushion gas is not going to market.

On the other hand, the storage pool in almost every case will be closer to market than the original source of the gas. A good many storage pools have their own compressor stations which do the pumping into the pool against existing rock pressure. Such costs are charged to storage expenses. Once in the ground the cushion gas has the effect of permanent horsepower in place close to market and without doubt reduces future pumping costs.

Where the gas pumped is not cushion gas, but instead is annual input and output gas, pumping in the summer is merely reducing the pumping in the winter, and since a better load factor is obtained, ultimate pumping costs are probably less.

Are We Going to Have a New NATIONAL FUEL POLICY?

By LARSTON D. FARRAR
Washington Editor

THE gas industry, plus many another industry in the U.S. today, is intensely interested in every fact and facet about the studies being carried on by the Senate Committee on Interior and Insular Affairs, pursuant to the Senate Resolution 239, 81st Congress, second session. This resolution directed the Senate Committee to investigate the available fuel reserves of the nation, and, if possible and necessary, to formulate a national fuel policy for the United States.

Exclusive

This committee, under Sen. Joseph C. O'Mahoney (D.-Wyo.), chairman, for some months has been making an intensive study of the actual status of the fuel situation in the U.S., as it relates to coal, natural gas, manufactured gases, oil, and other fuels of every kind that impinge in any important way on the national committee. So far, staff investigators have been pursuing what they term a "fact-finding" attitude, and, from all indications, will continue in their apparently unbiased efforts to put before the Congress and the nation a complete picture of the situation.

Senator O'Mahoney, who has won national attention on more than one occasion in the past because of activities as an economic investigator, seems in no hurry to hold general hearings on the formulation of a national fuels policy. The senator is much alarmed at international developments and is represented by associates as being extremely busy on many other important pieces of pressing legislation. This is leaving the impression—whether it is justified or not remains to be seen—that the senator does not consider that it is a good time, in the middle of a medium-sized war that at any time could turn into a general war, to upset the natural "balance of power" among the various competing major fuels. He seems more inclined, from what interviewers say, to be satisfied with making a more-or-less innocuous factual report, leaving until another day—say, after the present crisis has passed—before burdening his colleagues with a new fight. And there is little doubt but that any proposed national fuel policy that would be in the slightest discriminatory—in the long or short run—to any particular fuel would occasion a knock-down-drag-out Congressional battle.

The chairman has a background in this field that qualifies him as an expert, so it is likely that he knows more about the potentialities of an oil-coal-gas battle than any other man. He was chairman of the Temporary National Economic Committee in the '30s, and later was chairman of the Special Senate Committee to Investigate the Petroleum Industry, which naturally led him into corrolary studies of coal and gas. It was from that committee's findings, several years ago, in fact, that the idea of formulating a new national fuel policy took first verbal form. The suggestion was made that sometimes—just when was not specified — the nation would have to adopt more stringent controls over the various fields.

Hearing This Month

Hearings were scheduled to begin in June, but just when has not been definitely decided. It was felt highly likely that the hearings would be held before June 30, when the committee is supposed to make a report to the full U.S. Senate. However, there have been other extensions of the life of the study and there possibly may be another one. If so, an interim report may be filed.

Chief attorney for the Committee on Interior and Insular Affairs is Arthur A. Sandusky, who has general charge of collating the mass of statistical information which has been published so far in Senate Document No. 8, 82nd Congress, 1st session entitled, "Basic Data Relating to Energy Resources." This document, which is assumed to be of great value in that its statistics were gathered from official sources, has the basic data on which all decisions of the committee will be made in the coming weeks.

As of today, or at least in the period before public hearings actually have begun, the committee has sponsored a series of "round table" discussions at which the viewpoints of representatives from various competing fuels industries have been given so that areas of agreement and disagreement might be explored and clarified. The first such "round table" discussion was held in March.

In addition to the Senate document already mentioned on "basic data" relating to America's energy resources, the committee also has had printed a statement by the U.S. Geological Survey entitled, "Fuel Reserves of the United States."

Long Road

Mr. Sandusky, the committee chief counsel, has emphasized in personal conversation what is generally known—that whatever the committee recommends will not immediately become the law of the land. As a matter of fact, even if the committee makes any concrete recommendations relating to the establishment of a national fuel policy, it is a foregone conclusion that it may be months, if not years, before such recommendations will be passed by the Senate and the House of Representatives. Since the House of Representatives has not had a similar group at work, and in view of the fact that this is a highly-controversial subject, fraught with both national and international consequences in many fields besides the natural gas industry, it seems likely that no new national fuels policy will be adopted in this session of Congress. And if the President and the Congress remain at loggerheads, with a continuing lack of confidence in the Executive Branch being noted among legislators, it can be said with some assurance that *no* legislation relating to a national fuels policy will be passed next year, or as long as

the Congress is constituted as it is at present, which will certainly be until Jan. 3, 1953.

So, in a very real sense, discussion of a new national fuels policy at this time is more of an academic pastime than it is a vital contribution to a pressing debate. But what worries the natural gas industry—and other industries—is the *possibility* of such a policy being adopted in the foreseeable future.

The natural gas industry fears a national fuel policy because such a policy would involve *end-use* control of its product. This would hamper distribution, probably cause much higher prices to consumers who were permitted to use gas under any such policy, and conceivably could be disastrous to the industry.

Biggest reason why such end-use control is even hinted in federal circles is that natural gas is a non-renewable resource.

Coalmen Favor It

The coal industry—which admittedly has access to an almost inexhaustible supply of its fuel in the ground—at the same time *favors* a national fuel policy for many reasons, not the least of which is that the industry would have a competitive advantage in the short run. Many industries which now use gas on an offpeak basis, under any national fuel policy as visualized by some federal planners would not be allowed to use natural gas at all, thus making it inevitable that they turn again to coal, or to some other fuel.

Since there already is a national fuel policy, in the strict use of that term, any projected fuel policy to be laid down by Congress would be "new." The present national fuel policy is based on the American Constitution, which leaves to the various states and to the people all powers not specifically written into the Constitution for the federal government. Except for state conservation laws, and the natural physical limitations that obtain in any given situation, there has been and is no restriction on the amount of natural gas that can be sold to all users, or prospective users of natural gas.

Under this "old," or existing, natural gas policy, it is admitted, the industry has put into effect voluntary gas conservation measures to prevent the outright waste of any of its products, insofar as scientific knowledge and techniques allow. Likewise, under this existing policy, the industry has constantly expanded not only its outlets for natural gas into all phases of the nation's economic life, but, in fact, virtually to all parts of the nation itself. At the same time, it has carried through extensive and intensive explorations to find more gas reserves every year than the amount of gas consumed in that year by all American customers.

Americans traditionally have felt that any economic use of any resource in any period was justification of itself. The average American ought to be shown his stake in this fight on "end-use" control of natural gas. He ought to be told that as long as cheap natural gas is available, he ought to be allowed to get it cheaply. He ought to be told how it works, through industry, to actually lower his costs on a variety of products made by industry, and that if industry could not use cheap natural gas—instead, *had* to use coal, or some more expensive fuel—the cost of many products used on farms, in homes and factories would go higher.

If natural gas is to be "saved," by end-use control, who is to determine how it is to be "saved"? This question, as asked by the natural gas interests, is answered readily by federal experts. *They* will have the say-so.

The coal interests—and others—who want to see "end-use" controls applied to natural gas may not realize it, but they are helping to dig the grave for private enterprise in every field, including their own. If the principle that the federal government can regulate the *use* of fuels is established, and is applied in the gas field, what is to prevent the same federal government from applying the same restrictions in the use of coal, or any other fuel, at some future date? If one fuel is to be shackled with bureaucratic controls as to its end-use, what is to prevent the bureaucrats from shackling other industries with the same controls? If the mother can be told how or when she can use her gas, what is to prevent other bureaucrats from telling her whether or not she can own an electric refrigerator, a gas refrigerator, or an old-fashioned ice-box?

Temporary Gain

But it is highly unlikely the vested interests in the coal industry will have any more perspecuity or far-sightedness as to where "controls" lead than have other segments of American industry who in years gone by have seen the areas of freedom shrink again and again—mostly because of the agitation of "free enterprises" in competing fields who thought they could obtain a temporary advantage by using the facilities of the government's police power to obtain the advantages. It is a sad but tragic fact that in almost every socialistic encroachment by the federal government for more than 50 years, certain business interests—who stood to gain temporarily by the socializing—have fought with the collectivists. The same phenomenon still is taking place, as in this instance of the coal interests cooperating fully with the bureaucrats who want to establish "end-use" controls for natural gas.

The coal interests, it must be admitted, have the weight of "influence" on their side in legislative and executive circles in Washington today. The resolution under which the Senate committee is making the study of a potential fuel policy was introduced by an administration stalwart, former Sen. Francis J. Myers (D.-Pa.), who lost out in the past election. But his successor, Sen. James H. Duff (R.-Pa.) likely is as much in favor of the coal viewpoint as was Senator Myers, due to the tremendous amounts of money invested in coal-mining operations in Pennsylvania. There are many other influential legislators and not a few persons in the Executive Branch who are anxious, or at least would lend their influence to any move, for a new national fuel policy that would allow this or that agency to determine the end-use of natural gas, and other fuels, with the idea in mind specifically of limiting the use of natural gas for industrial purposes, and, possibly, for other purposes.

Voters May Balk

It is possible that the swift, unprecedented development of new markets for natural gas in recent years—coupled with the fact that the cheapness of the fuel for the consumer is made possible only by volume sales in off-peak seasons to industrial users—*may* be the saving factor, from the standpoint of the natural gas industry. With millions of consumers enjoying this low-cost fuel today, many politicians who otherwise would go along with the "control" movement may be constrained, by the insistence of their constituents, to vote against establishment of a national fuel policy that inevitably would raise natural gas prices. The American people, right now, are in no mood to support any movement, open or subtle, that would drive up their cost of living, as a new national fuel policy almost inevitably would do.

Perhaps the better part of valour for the natural gas industry, in view of the situation, would be to "wait and see," legislative-wise, but on the public relations front to get to work even more vigorously to convince the people that the word "conservation" has many meanings and that not every bureaucrat who talks about "conservation" means the same thing as the average man means when he thinks of conservation of the nation's resources. The average man thinks of conserving his funds, he thinks of producing efficiently, and he thinks of the advantages that can come to him from living well today. The bureaucrat, when he thinks of conservation, may be thinking of a lifelong job he can make for himself.

Now Is the Time to Tell Our Competitive Story

By C. GEORGE SEGELER
American Gas Assn., New York

ON THESE PAGES are abridged versions of four addresses presented at recent gas industry conferences. Mr. Segeler's talk, presented before the AGA industrial-commercial sales meeting in Washington in April, provides new ammunition for the competitive battle; Mr. Brown's report to the Dallas natural gas meeting in May explains the operation of PAD's machinery; Mr. Hulcy's talk at Dallas scores the proposed national fuel policy; Mr. Hess' report to GAMA at the annual meeting in Chicago in March carries on the one-man needling campaign he has been waging in recent months.

IT would be interesting to run an opinion survey in gas company sales departments to find out whether they think the time is appropriate to bring competitive issues into the picture. The disadvantage of raising competitive matters is obvious and may be summed up by the statement that this would put ideas in the customer's head. This view is opposed by those who feel that such thinking is unrealistic, since the promotional efforts of our competitors have by now certainly reached into every nook and cranny of the commercial cooking field.

If that contention is true it would certainly be better to lay the facts on the line and thereby to furnish effective counter-ammunition to the customer who has undoubtedly heard our competitor's story. Certainly that story has not disguised its attack upon gas except to the extent that it may have been prepared around the euphemism "flame cookery" spoken with a slight but noticeable sneer.

Even supposing we were of divided opinion as to the advisability of discussing competitive matters when the sale is going our way, it does not seem likely that we would be of divided opinion regarding the necessity of knowing the story ourselves and making sure that all of our salesmen understand the competitive picture, the method of calculating competitive costs, and the sources of reliable authoritative data which cannot be brushed aside by airy statements by a competitor's salesman.

Nor is it enough that our own sales forces be educated. A much more difficult task, and one which has probably not been tackled on any large scale as yet, is before us: the enlightenment of the sales forces of kitchen equipment dealers. The latter is the more difficult part of the problem of putting our story across for two reasons: first, the difficulty in securing their attention and, second, the time that it would take to do an effective job. This also works both ways; it is hard for us and it is equally hard for our competitors.

But, we may be making the mistake of assuming that our competitors are not able to or willing to make that extra effort and that as a result the dealer salesman can be expected to take a neutral stand. This is unwarranted underestimating of competitive sales and promotional efforts and at best would mean that one of the principal agencies selling commercial equipment was uninformed as to the facts. The ultimate customer, the commercial kitchen owner, might regard statements from a kitchen equipment dealer, presumably in a neutral position as far as gas and electricity are concerned, as being less biased than a gas company or electric company salesman.

If such an attiude exists, and I don't know that it does or doesn't, it would be an added reason for informing our sales allies about our findings with respect to gas and electric appliances and their actual performance under comparative conditions. To me, this means that we should explain:

1. Shrinkage.
2. Quality of foods.
3. Temperature and humidity in kitchens.
4. Relative cost.

Another difficulty that we might as well face is that the larger equipment dealers may have various local branches but a central headquarters in only a limited number of cities. In these cities it may or may not be the policy of the local gas company to do missionary work with the commercial equipment houses. In one large city I am certain that there is not even the slightest attempt to do such missionary work among kitchen equipment houses and yet it is the headquarters of a number of the largest ones in the country. Therefore, one must view the problem of facts and figures not only from its immediate impact upon our own men but from a much larger viewpoint.

The real solid core of our claims rests upon valid comparative fuel studies under practical operating conditions. In these we have not supervised the work of the cooks and there have been no laboratory conditions imposed; they are the results which the cooks obtained in practice and which any other cooks would obtain were they to cook the same foods.

Where have such studies been made? Well, the first one I remember was done at Childs' restaurant in New York a great many years ago. Then, there was an elaborate study conducted by the U. S. Welfare Assn. in the Mall cafeteria on gas and the Revenue cafeteria on electric equipment. In 1948 the well-known Alfonso restaurant study was completed and shortly thereafter the extensive investigation at Southern Methodist University.

How do these various studies compare among themselves and how do they compare with electric industry claims? The answer to the first question is that they are consistent. That is important because reproducibility of results is one important criterion of the validity of the answers. These four studies were done by widely separated and independent personnel, both in point of time, in method, and in responsibility. In the Mall cafeteria study, in particular, members of the gas and electric industries had no part in the work but were merely given the answers when the association was through collecting the data. In the Southern Methodist University study many months of patient meter reading of independent submeters finally yielded the firm foundation of fact upon which we are resting our case.

All of these data demonstrate that the energy ratio of gas to electricity in commercial cooking establishments is well under 2. I use this number only to contrast it with the electric industry claim of 3. Now as to what the actual results we have obtained are, I list them for you:

Mall cafeteria	1.6
Alfonso's restaurant	1.4
Southern Methodist University	1.65

These energy ratios are all very well

but what is it all about? For the run-of-mill kitchen contemplating the use of electricity, their interest necessarily centers around one of two matters. Either they are dissatisfied with our gas service or they have accepted electric industry claims—lower shrinkage, cooler kitchens, more modern equipment, safer operation, or even that story that fuel costs do not amount to much anyway compared to other more expensive things. Either of these two points suggests its own solution. We can profitably examine our own situation with regard to the kind of service that we render. That service has two parts: one is the inspection, cleaning, and maintenance of appliances, but the other part of our service is to tell our commercial kitchen customers about gas and gas appliances and what a good job they can do with the right equipment.

Knowing full well that the total number of commercial gas salesmen is lower today than it has been for some years, we can only blame ourselves for failure to hold the load through failure to keep gas sold through personal contact at a time when our competitor is making such a direct approach. Here then, our job is dynamic, calling for a continuing sales program, securing orders for new gas appliances to replace the old ones that are worn out, obsolete, or of the wrong type for the particular cooking job being done. And at the same time that these sales contacts are made we should keep our eyes open for the performance factors: is equipment overloaded, is it improperly adjusted, is the ratio of fried food per pound of fat too high for the fryer in question, is the hot water supply correct, in what shape are the counter appliances?

If we now turn to the second possibility, namely that electric claims are being accepted, then what is our job? The first move may be a defensive program of securing the information required for the rebuttal of electric propaganda and then finding the opportunity to present such information in a convincing manner. That is still defensive. To take the aggressive side, we come back to the same deal that has just been outlined and that always is the basis of a successful sale. That is where these competitive tests are useful—the tests on meat shrinkage, the tests on commercial kitchens, the tests of deep fat fryers. They must be translated into everyday terms and their meaning made clear to our customers. Let us take the energy ratio as an example. This is translated into relative operating cost using the cutomer's own gas consumption as the base, showing him the cost of the equivalent number of kilowatt hours plus the increase in demand charge, plus the increase in maintenance and other expenses.

That's the type of selling story that will do the job.

How PAD's Divisions Regulate The Gas Business

By BRUCE K. BROWN
Petroleum Administration for Defense

PAD's responsibilities for the transmission and distribution of natural gas are similar to those which were exercised during World War II by WPB's Office of War Utilities. In the present mobilization organization, they are vested in PAD. They have been placed under the jurisdiction of Assistant Deputy Administrator C. Pratt Rather, and the day-to-day administrative work is carried on by three operating divisions established for this purpose. These are the gas planning division, the gas operations division, and the gas facilities division.

The gas planning division is a program group which is concerned with long-range estimates and planning. Its task is to forecast future supplies of and demands for gas, and to make recommendations as to what steps should be taken to assure that adequate supplies are made available at the points where they are needed.

The gas operations division is concerned primarily with the utilization for defense mobilization objectives of the existing facilities for transmitting and distributing natural gas and for manufacturing and distributing artificial gas. Because of increasing demands for natural gas and the decreasing supply of materials with which to construct facilities to transmit it, the country now faces the unfortunate prospect that this vital fuel is likely to be in extremely short supply the next few years.

It may be expected that shortages will occur in a number of important industrial centers and in such a way as may adversely affect defense production. It will be the primary responsibility of the gas operations division, working with the Federal Power Commission, state regulatory bodies, and the units of the gas industry itself, to take steps to assure that the best possible use is made of available gas supplies.

The gas facilities division is primarily concerned with the construction of additional facilities for gas transmission and distribution. This responsibility involves the preparation and evaluation of claims for materials needed to finish transmission and distribution projects already under way and those needed to start new projects. It extends also to the screening of such projects to assure that only those materials that are absolutely essential are incorporated in PAD's claims upon other agencies during this period of short material supply.

A single materials division services all operating branches of PAD. It is staffed with people who are informed as to the materials used in the gas and oil industries and carries out the policies and decisions of the various operating branches of PAD, including, of course, the gas branch.

We in PAD believe that if the oil and gas industries can be nurtured with a minimum of regulations and with the construction materials they need, they can meet any reasonable civilian and military demand.

Free Gas Industry Boosts Standard of Living

By D. A. HULCY
President, Lone Star Gas Co., Dallas

TODAY the gas industry has 52% more customers than it had in 1935, and it made that enormous gain while the population of the country increased less than 20%. From less than 16 million customers in 1935, it has expanded its service to more than 24 million customers last year.

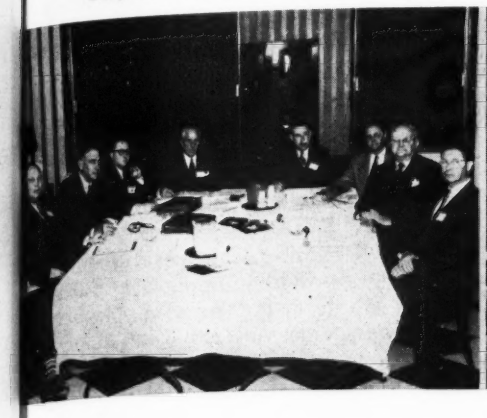
But this isn't half the story, for while the number of customers increased by 52%, the total sales, expressed in thermal units, made a gain of 223%. They advanced from about 13 billion therms in 1935 to 42 billion therms in 1950. And it provided this enormously increased service at a lower cost, for while the sales, expressed in thermal units, increased 223%, the total revenue, expressed in dollars, increased by less than 167%, or from approximately $750 million to about $2 billion.

Think of what this record of growth has meant in terms of the living standard of the American people. Think of the numerous other national industries which the gas industry has expanded to serve, and to serve more efficiently and economically than they have ever been served before, if you please, thus in-

WASHINGTON. A. D. Wilcox, Eclipse; A. H. Koch, Surface; H. A. Clark, MichCon; A. M. Thurston, East Ohio; S. C. Parker, Peoples Gas; R. E. Crane, Elizabethtown; Carl Wierum, BU; S. T. Olinger, Cincy Gas; K. I. Robinson, Newark.

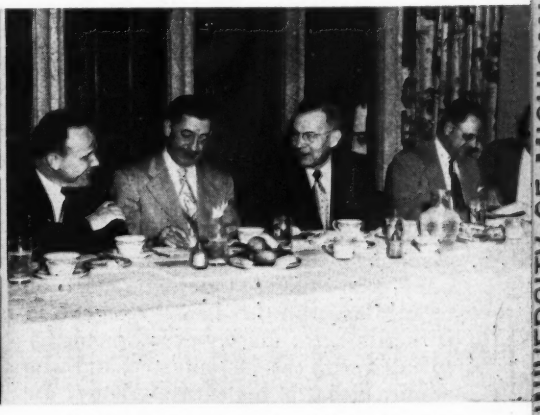
BILOXI. Carl Horne, outgoing Southern Gas Assn. president, delivers his report of stewardship at the 43rd annual meeting. Registration of delegates set new records, reflecting SGA growth under his and predecessors' leadership.

DISTRIBUTION ROUND TABLE. At Biloxi, Aubrey Randall, Chevrolet; Warren Colline, Lon Star; Fred Bradley, Southern Union; R. B. Hurt, Hardwick; C. F. Wilson, Lone Star; R. A. Puryear Jr., Alabama Gas, chairman.



COVERING THE CONFERENCES

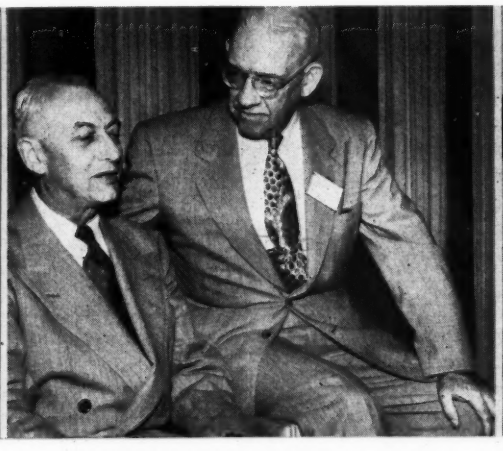
Major spring meetings in the gas industry in April and May blanket the map. Five of the top ones are represented here: the industrial-commercial sales meeting in Washington, with the metals committee shown; Southern Gas in Biloxi, Miss.; the AGA distribution meeting in Memphis; Indiana Gas Assn. at French Lick; natural gas meeting, Dallas.



INDIANA. E. E. Linburg, Richmond Gas, receives president's gavel from C. K. Graham, Evansville. Edward Hahn, Kokomo; Clarence Goris, Gary, look on.

DISTRIBUTION MEN. At Memphis, Lewis Heyman, Memphis Light; M. C. Miller, Ebasco; H. G. Howell, Memphis. Howell and Miller were subcommittee chairmen.

MEMPHIS. Ben Gault, Robertshaw; Ray G. Juergens, East Ohio; J. G. White, Peoples Gas; G. B. Johnson, Minneapolis Gas; E. F. Hart, Boston Consolidated.



AT SPRING MEETING. G. F. Mitchell, Peoples; F. H. Lerch, Consolidated Natural; R. G. Taber, B. L. Maulsby, Atlanta.

NATURAL GAS LEADERS. E. F. Schmidt, Lone Star, program chairman; C. E. Bennett, Manufacturers, department chairman.

DALLAS. A. A. Cullman, Columbia Engineering; M. V. Burlingame, Texas-Illinois; A. W. Emerson, soil conservationist.

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creasing their own efficiency and productivity! And relate all this, too, to the living standard of the American people.

I think the spectacle which our industry has provided, and is still providing, of what free men can accomplish, through voluntary cooperative effort and individual initiative under a free economy, is the strongest kind of support of the cause of freedom in our country and in the world.

Recently the Senate Committee on Interior and Insular Affairs compiled a document on "Basic Data Relating to Energy Resources." It presents data on the growth in production and consumption, the relative position, and the prices of each of the various fuels. This committee is charged with the formulation of a broad "national fuel policy to meet the needs of the United States in times of peace and war."

I don't know what the members of the committee intend to do with these data, or what kind of a fuel policy they are likely to recommend.

But I recall the technocracy craze back in 1932. The technocrats undertook what they called "an energy survey of North America." They purported to have compiled data on energy resources which showed that it would be possible to produce goods of all kinds in such abundance and with so little human effort that everybody could be provided with the equivalent of an income of $20,000 a year by working only those persons between the ages of 25 and 45 only four hours a day and four days a week. I recall all this because it reminds me of the fantastic findings than can result when inexperienced theorists with pet schemes of reform get to surveying the energy resources of this country.

Nothing is so fundamental in relation to the productivity of any people as an adequate and increasing supply of heat energy. The reason the American people have more goods of all kinds to consume than other peoples is that they produce more goods of all kinds. And a fundamental reason why they produce more is that they have applied an ever-increasing amount of heat energy per worker to production.

During the first half of the 20th century the supply of energy in the United States was multiplied fourfold. It increased by more than 300% while the population increased 98%. The per capita consumption of energy was doubled. And the most striking feature of the developments making this great advance possible was the contribution made by oil and by natural gas.

At the beginning of the century natural gas was providing about 3% of the energy supply of the American people. Today it provides fully 20% of a supply that is four times as great as the supply of 1900. In other words, during a period in which the energy supply of America was multiplied by four, the energy provided by natural gas was multiplied by more than 26.

New Sales Policies Needed To Prevent Stagnation

By F. O. HESS
Selas Corp. of America

I recall a discussion with the sales manager of a large combination company, who expressed violent opposition to LP-Gas, who threatened resignation if the LP-Gas industry ever became associated with the gas industry, and who admitted that in his entire territory the customer has hardly any choice about fuel—company preference generally decides the matter. I wonder where the future of the domestic gas business lies, with the national trend to move farther out into the country, out of the city and beyond its mains, and whether the resultant change to electric appliances can be effectively retarded or stopped without more outspoken, deserved, and planned support of the LP-Gas industry. Whether the gradual build-up of these new suburbs can ever be resurrected for the gas appliance industry, or whether the lucrative new construction market is drying up for gas over the next few decades?

Does the gas industry have any domestic future if it does not follow this flight or drift to the country, and if not —what is it doing about it? Can the gas appliance manufacturers be satisfied to exist on a diminishing replacement market? While we discuss the pros and cons of ventilation and ignition and automatic heat, and worry about the cost of these "extras"—your big home competition, the automobile, is selling your own customers an automatic gadget, a convenience to the tune of $450 million a year, about 50% of the total annual gas appliance sales. Yes, the "optional" automatic gearshift seems to prove how much our American public is willing to spend for gadgets, for convenience, for laziness, and the automotive industry cashes in—while we argue about CP, and ignition, and controls, and $3 per water heater, and so on.

And we half-heartedly develop essential control devices, ignition systems, automatic features, and indecisively discuss service problems, while we are being sold and buy the automatic gearshift having some 450 individual parts. We know it requires service and we accept it and pay for *it and* the service. Is there a more complicated gadget than a television set? And we buy it, fully aware that it is not perfected, and we buy a service policy with it. Maybe we are mainly members of the traditional gas industry and as such not part of the public, or have lost contact with the public.

I wonder further whether the gas appliance industry might not justifiably underwrite a contest, open to all architects and architectural schools, let us say for a first prize of $10,000 or more, for the best design of a gas utility kitchen, all-inclusive and with ventilation, etc.

Could that not arouse the interest of the coming crop of architects as well as the established ones, and familiarize them with gas equipment and requirements? Could it not furnish designs for ventilation systems incorporated into the home structures and lend itself to popularizing and promotional publicity of far greater benefit than the prize money? Could it not promote the inclusion of gas incinerators into homes, into kitchens, into the range or heating plant if necessary and practical, as a convenience of first order, and counteract the far-flung and far-range plans for the electric garbage disposal unit with its limitations and impact on our pocketbook by demanding new sewage systems?

Could it not promote the development of competitive devices to the electric plug-in connector strip to reduce the cost of installations, facilitate future additions and simplify the replacement sale of new appliances? Would not a coordinated, well designed fuel system help all gas appliances, heating and air conditioning? Might not such a challenge of outside talent contribute new and valuable ideas, aside from the help such general design would lend to builders and the appliance dealers and utilities, and the home owner, our ultimate customer? Would not the local architects gain knowledge and be stimulated from these studies and therefore be of effective help to an interested client, and support our promotional efforts? Would this professional self-education not activate rebuilding programs, and modernization of the basic and essential utilities in the *old home* market?

ASSOCIATIONS

Texas Gas Export, National Fuel Policy Important Topics at AGA Spring Meeting

Smoldering resentment among native Texans over steadily growing exports of natural gas from their state broke into full flame last month when Olin Culberson, chairman of the state's railroad commission, took the floor at the AGA Natural Gas Department's spring meeting in Dallas.

Mr. Culberson minced no words in declaring his opposition to the organized drainage of the state's natural resource for consumption in other states.

"Let Texas keep its gas and let the East keep its coal," he said. "What's going to happen to 7 million Texans when all their gas is gone?" In commenting on experts' contentions that reserves sufficient for 100 years' use are in the ground, he asked: "What's 100 years in the economy of Texas or the United States."

Rebuttal to the Culberson arguments came the following day, when Paul Kayser, president of El Paso Natural Gas Co. and of the Independent Natural Gas Assn., rose to speak. Diverging from his prepared address, Mr. Kayser swung hard at bills under consideration in the Texas legislature designed to curb export. "These bills are punitive," he said.

"It was decided in 1789 to consider the nation economically as a whole," he asserted. "No state could place restrictions upon interstate commerce.

"Until discoveries are less than consumption, you have no threat. But when reserves do go over the hill, you should be prepared to build plants to make gas from coal." Mr. Kayser then proceeded to outline the potentialities of one of his pet subjects—the future conversion of the nation's natural gas pipeline network (which already traverses the major coalfields) to the transport of gasified coal.

D. A. Hulcy, president of Lone Star Gas Co., the AGA, and now the U. S. Chamber of Commerce, struck at another controversy of extreme importance to the industry—the proposed national fuel policy. Said he:

"I know there are men and women in the government in Washington and men in Congress who seem honestly to believe that our people would be better off if our economy were politically managed by bureaucrats. They call it planning, and they imply by that term that there is no planning under a free economy. I am quite certain that a 'national fuel policy to meet the needs of the United States in times of peace or war,' formulated by such men, would end in disaster for the country."

His address, "The Significance of a Free Gas Industry," traced the leaps-and-bounds growth in energy production, and particularly in natural gas' contribution, in the past decade and a half. His thesis was that only under a free economy could these astounding advances have been made.

Other addresses heard at the two general sessions touched more directly on the subject of defense. Bruce K. Brown's message, delivered by William S. Tarver, assistant general counsel of the Petroleum Administration for Defense in the absence of PAD's deputy administrator, explained the machinery of gas industry mobilization today, and compared it with that in force during World War II. His title—"Mobilization for Defense."

John E. Goble, president of National Tube Co., Pittsburgh, delved into the current steel situation as it affects natural gas growth and is affected by mobilization, in a talk titled "Together We Grow."

The fabulous growth in demands of natural gas companies for steel was cited in such statistics as these: "There are today almost 60 million tons of steel buried in the soil of the United States, serving the oil and gas industries . . . pipe producers by 1950 have supplied, for the gas industry alone, 375,000 miles of utility gas pipelines . . . By 1940 there were approximately 15,900,000 tons of gas pipelines in the ground in the United States. By 1950 there were almost 30 million tons in the ground . . . From 1936 to 1945, sales averaged only 350,000 tons per year; during 1949, 1.6 million tons were shipped."

On production capacity: "In 1945, the annual capacity for all pipe and tubular goods in the United States was 8,365,000 tons . . . At the present time it is 12 million tons (to be increased to 13 million)."

As to the future: "Regardless of controls, if the international situation does not change . . . steel will be made available for transmission pipeline production in amounts such that the 1950 production rate of 2,425,000 tons will be exceeded in 1951 and 1952."

F. H. Lerch Jr., president of Consolidated Natural Gas Co. of New York, speaking on "Regulation and Legislation from Management's Viewpoint," warned executives that they must fight constantly for fair federal legislation. "Keep yourself well informed on all such matters," he advised. "Find out how to use this information."

Rounding out the program for general sessions was a thorough reporting of "Research Developments" by Elmer Schmidt, vice president of Lone Star.

(For a report of the transmission section meetings, see the Pipeline News section in this issue.)

Aggressive Selling Need Stressed at SGA Confab

A search for answers to a multitude of defense-born operating problems lured more than 1300 gasmen to Biloxi April 23-25 for the 43rd annual convention of the Southern Gas Assn.

But there was nothing defensive about selling and operational attitudes as they listened to leaders in the industry predict a continuation of the strong expansion trend in the business. Challenges with a familiar ring were heard—manpower shortages, materials shortages, and governmental interference with the course of business. And underneath, the undercurrent of concern over another phenomenon—sales resistance in the period of a seller's market.

Southern Gas, which has enjoyed a growth matched by few such groups, annually sets up a schedule for this meeting that defies a comprehensive reporting. Transmission meetings vie with distribution sessions and sales meetings for the delegate's attention. But of all the subjects, a comparative newcomer—employee relations—probably stole the show. Study of the subject took a new tack, stressing "employee development," but weaving into

EXTERIOR VIEW of Southern Union Gas Co.'s remodeled office building in El Paso. Formal opening was attended by 1800 persons. Outstanding features are a large auditorium on the second floor and a basement display room for heavy duty gas equipment.

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Shown here are some of the 110 cooks who went to work on as many CP gas ranges during the world's largest baking contest at the National Orange Show.

110 Cooks Compete in Mass Baking Contest

Champion CP gas ranges — 110 of them — were teamed up with southern California's champion cooks at the largest mass baking contest in history, held in connection with the 1951 National Orange Show in San Bernardino, Calif. on March 13.

Eight leading manufacturers supplied ranges for the event, and seven Servel gas refrigerators were installed in the contest hall. Crews from Southern Counties Gas Co. and Southern California Gas Co., Los Angeles, laid prefabricated pipe to bring in the gas and tested the appliances.

Co-sponsored by the National Orange Show and the California Fruit Growers Exchange, the exhibition produced 55 championship orange cakes and 55 first-class lemon pies.

Mrs. Harry O. Myers, left, turned out the best gas-baked lemon pie and Mrs. Eva Herrick's orange cake won top honors for her. Each received a new automatic gas range.

this the problem of "executive development."

Dr. Earl G. Planty, New Jersey industrial relations expert, served as moderator for the discussion, presenting with it his own paper on how to train the executive for the important task of meeting industrial relations problems. Other parts of the round table considered the individual and the supervisor.

Dr. Walter J. Couper of Toccoa, Ga., summed up the importance of the industrial relations problem with these words:

"Your troubles will strengthen the growing realization that employee relations is a top management responsibility which must rank in importance with production and sales. 'Last time' we brought both idle men and machines into production; we not only fought a global war but simultaneously raised the civilian standard of living. Now, our economy is operating at full capacity and whatever goes into defense must in major part be taken from civilian consumption. The standard of living must decline."

Outgoing president Carl Horne of Birmingham, Ala., who later relinquished his gavel in favor of the new president, L. L. Dyer of Lone Star Gas Co., Dallas, wielded the cudgel once more for a better sales job on gas ranges. Two points were stressed: 1. Gas ranges have not been improved as rapidly as have competitive ranges. 2. We suffer competitively on the gas range by virtue of mal-distribution. His conclusion was that a stronger joint action is required between utilities and manufacturers, regional and national associations to cure these faults.

Inspirational speaker of the three-day meeting was D. A. Hulcy, the nation's "No. 1 gasman."

Coverage of today's burning issues was provided in talks on "Defense Measures for Gas Distribution Systems," "Excess Profits Act of 1950—its Application to Natural Gas Companies," "Governmental Regulations in Industry," "Comparison of Competitive Equipment," "What Will the Sales Program of the Gas Industry Be During the Present Emergency," "Labor Relations in a Mobilized Economy," and a discussion of the automatic range ignition program.

Officers serving under the new president, L. L. Dyer, for the coming year include J. H. Wimberly, Houston Natural Gas Co., first vice president; H. K. Griffin, Mississippi Gas Co., Meridian, second vice president; J. L. Campbell, New Orleans Public Service, secretary; Kyle Turner, Atlanta Gas Light, assistant secretary; H. V. McConkey, Southern Union of Dallas, treasurer. Directors elected are Charles K. Oxford, Columbus; R. A. Puryear, Birmingham; Charles Lockhart Jr., Bryant Heater, Tyler, Texas; H. C. Webb, Oklahoma Natural, Tulsa; E. L. Henderson, United Gas Corp., Shreveport. Chairman and vice chairman of the advisory council are R. G. Taber, Atlanta Gas Light, and C. H. Zachry, Southern Union, Dallas.

Awards for outstanding association work went to D. A. Crawford, Atlanta, distribution section chairman; J. B. Crumpler, Fayetteville, Ark., accounting section; Eli R. Cunningham, Shreveport, transmission section; Terry Hart, Nashville Gas & Heating, sales section; Curtis M. Smith, Tennessee Gas, employee relations; J. L. Campbell, convention chairman; Chester L. May, Lone Star, Dallas, and Carl H. Horne.

Memphis Meet Spotlights Corrosion Control

Corrosion control has an important role to play in today's national defense emergency.

How that role fits in was explained by E. Clyde McGraw of Transcontinental Pipe Line Corp., Houston, in his general session address before the 750 gasmen gathered at the AGA distribution, motor vehicle, and corrosion conference in Memphis, Tenn., in late April.

"The economic feasibility of many pipeline projects depends upon taking advantage of the cost saving made possible by higher carbon, thin-wall pipe," he said. "The present defense program makes it necessary for us to utilize our dwindling steel resources to the best of our ability. The technological advances which have made possible present-day steel pipe also make mandatory the prevention of metal loss by corrosion.

"We might consider the use of pipe having a thicker wall, so as to allow some margin for corrosion loss. However, if we overdesign the 30-in. pipe for a line from Texas to New York to have a wall thickness only 1/16th in. greater than necessary, we have added 92,000 tons of steel and increased the original investment in the order by $20 million."

Mr. McGraw also cited other figures to prove the cost savings possible when a corrosion control program is incorporated in the early stages of pipeline construction.

Mr. McGraw's address was one of the general session features of the three-day meeting, convened April 16-18. He shared the first morning's program with H. Carl Wolf, managing director of the AGA, and an industrial relations panel of five experts. J. J. Novy of Peoples Gas, Chicago, acted as moderator.

The other two general sessions were devoted to studies of a more technical nature, except for a forum on "Protection of Distribution Systems From Enemy Action," which closed the third session.

Daily luncheon conferences, running into

the afternoon, delved into varied problems on an operating plane. Construction and maintenance, corrosion, distribution design and development, meters and metering, motor vehicles, and work on consumers' premises were themes for the meetings.

An added attraction in the form of a special session on safety packed the convention hall on the last afternoon of the conference. A skit, narrated by E. S. Beaumont of Peoples Gas, Chicago, emphasized the importance of accident prevention. Valuable door prizes were awarded at the close of this session.

Many gasmen took advantage of the opportunity to inspect the top-flight gas dispatching and remote control system of the host company, Memphis Light, Water & Gas Division, afforded by daily guided tours.

Hulcy Headlines Mid-West Sales Meeting Program

Featured speaker at the annual conference of the Mid-West Regional Gas Sales Council, held April 9-11 in Chicago, was D. A. Hulcy, president, AGA and Lone Star Gas Co.

More than 500 sales executives and utility and manufacturer representatives heard Mr. Hulcy accuse utilities of failing to do a good selling job—paying only lip service to selling. "If we don't sell," he said, "there is no reason for the industry." He recommended more and better sales power; improved gas appliances and equipment and a better pattern for distributing them; better appliance installation and service practices; more advertising, promotion, and publicity at the local level; concentration on the new home market; and more participation in industry-wide promotion and advertising campaigns.

Albert P. McNamee, *McCall's* magazine, supported his statement that there will be no dearth of appliances this year by citing first quarter figures, which show the industry's greatest production in history. Inventories in many lines already are too heavy, he said. There will be plenty of merchandise, but better selling will be required to close sales.

Advantages of utility promotion of gas dryers were pointed out by Walter H. Kurdelski, Michigan Consolidated Gas Co., Grand Rapids, who also said that this profitable new market can be lost through lack of local sales promotion. Of the 295,000 automatic laundry dryers sold in 1950, 80% were electric, he said.

Measurement Course Grows

Largest enrollment in the 26 years of its existence was recorded by the Southwestern Gas Measurement Short Course on the final day of its 1951 sessions at Norman, Okla., April 10-12. Registration reached 942.

The three-day school also broke all former records for foreign attendance with five foreign countries represented — Canada, Mexico, Venezuela, Tunisia, and Algeria. Enrollment also included representatives of gas, gasoline, oil, and equipment manufacturing companies from 34 states. Thirty exhibitors had displays on the floor of the big drill hall on the North Campus of the University of Oklahoma where all of the sessions were held.

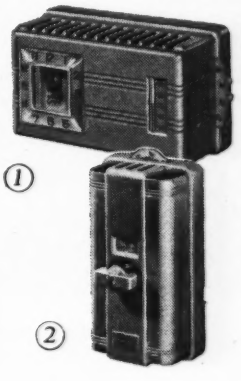
W. H. Carson, dean of the university's col-

Want to be in Clover, too?

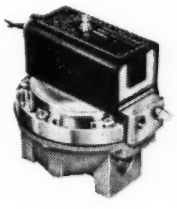
Then learn these important facts about Honeywell's top-quality controls

These Honeywell Thermostats have special features not found in ordinary controls!

1) Honeywell's new Chronotherms are the most sensitive, most accurate thermostats ever built! They automatically lower the temperature at night to save fuel; automatically raise it in the morning so your customers get up in a nice, warm house. *2) "Day-Nite" control* and a positive shut-off device distinguish the Honeywell Time-O-Stat from ordinary thermostats. The "Day-Nite" feature makes possible lowered night temperatures with automatic morning pick-up. Positive shut-off (optional at no extra cost) allows the home owner to turn off the heating plant—without making a trip to the basement.



Here are two of the best diaphragm gas valves ever made!



1) The new V899, illustrated, is a real engineering triumph! It fits far smaller spaces than previous valves, yet often exceeds them in capacity. And thorough field tests have proved that it's as safe and dependable as the older models. Available in sizes from ¾" to 2". Manual opener with automatic recycling optional. *2) The V898, (not shown)*, is specially useful for conversions and for installation on existing burners. Available with either a mounted or plug-in transformer, in ½" and ¾" sizes.

For full facts on any of the above equipment, write today to Box GS-6-107, Minneapolis 8, Minnesota

MINNEAPOLIS **Honeywell**

First in Controls

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lege ot engineering, which has sponsored the course since its beginning in 1924, announced that the executive committee had selected James L. Griffin, Northern Natural Gas Co., Omaha, as general chairman for 1952, succeeding B. F. Worley.

Pat H. Miller, Shreveport, chairman of the practical methods committee, announced that his group had prepared a special report on "Determination of Water Vapor Content of Natural Gas."

In recognition of her 25 years' service on the general committee, Miss Kate A. Niblack, Oklahoma Utilities Assn. secretary, was presented a wrist watch by the committee.

The 1952 short course was set for April 8-10.

AGA Sales Conference Attracts Record Attendance

Washington's Hotel Shoreham recently was the scene of one of the largest sales conferences of the AGA industrial and commercial gas section in recent years. More than 200 delegates participated in the April 2-4 meeting.

E. V. Fineran, Washington Gas Light Co., emphasized the need for better appliance servicing now that parts are less plentiful, and other speakers reiterated the urgency of this matter.

A 40-min. stage presentation, "What So Proudly We Hail," featured characters symbolizing eight advantages of gas for commercial cooking. The skit was given to acquaint gasmen with a new "package playlet" that will soon be available for local presentation.

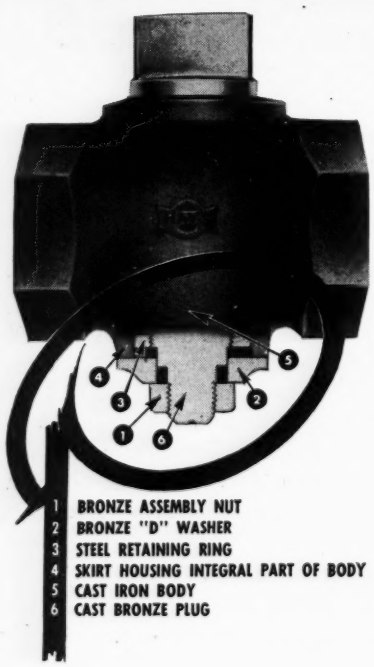
Suggestions for improvement of heavy duty cooking equipment were offered by George L. Anderson of the Army Quartermaster Corps. In summarizing the results of tests at Camp Lee, Va., he related the shortcomings of gas appliances used there. He expressed his belief that the AGA Seal of Approval has definite value, but he does not think it should be a "sacred cow."

AGA's utilization engineer, George Segeler, cited some facts and figures on competitive commercial cooking.

HAYS®

TAMPER-PROOF GAS STOPS

FEATURES


1 BRONZE ASSEMBLY NUT
2 BRONZE "D" WASHER
3 STEEL RETAINING RING
4 SKIRT HOUSING INTEGRAL PART OF BODY
5 CAST IRON BODY
6 CAST BRONZE PLUG

- Tamper-Proof Design with Non-Removable Plug.
- Extra Grade Gray Iron Body, Gas Service Bronze Plug.
- Steel Retaining Ring Prevents Removal of Plug.
- Steel Retaining Ring Assembled to Bottom of Plug—Eliminates Possible Damage to Precision Ground Surface of Plug and Body.
- Steel Retaining Ring Threaded and Staked to the Largest Metal Diameter on Bottom of Tapered Plug—Assures Retention without Distortion.
- Steel Retaining Ring Anchored without Drill Hole or Pin—Eliminates Possible Shearing of Plug.
- Steel Retaining Ring Located below Shoulder of Body—Permits Freedom for Service Adjustment of Plug.
- Steel Retaining Ring Recessed and Inaccessible within Iron Body—Gripless and Shearless.
- Plug and Body Precision Ground and Matched for Perfect Seating.
- Individually Tested Under Rigidly Controlled Inspection.
- Lubricated with a Compound of Greases Suitable for Use with Manufactured, Natural or Liquid Petroleum Gases.
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AVAILABLE IN

Black or Galvanized

Flat Head Less Check
Flat Head With Check
Flat Head With Lock-Wing

Sizes; ¾"—1"—1¼"—1½"—2"

Also HAYS STANDARD
HEAVY PATTERN IRON BODY GAS STOP

For 75 Years the Gas Industry has relied on HAYS Iron Body Gas Stops

Accountants Told Need For Upgrading Personnel

More top-flight accounting personnel is needed to meet the expanding requirements of the utility industry, Elmer E. Lindseth, president, Cleveland Illuminating Co., told the 1000 accountants from gas and electric utilities who gathered at Chicago's Hotel Sherman, April 23-25, for the 15th annual conference of electric and gas utility accountants.

Company programs must go beyond job training if accounting is to escape its present straight-jacket, Mr. Lindseth declared. Higher standards of performance in the utilization of money, manpower, and materials are required, he said.

Albert F. Tegen, president, General Public Utilities Corp., pointed out the need for simplification of annual reports and other presentations to employees and stockholders. Simple statements and tables often convey more to readers than complicated charts and graphs, he said.

The three-day meeting, which includes discussion groups and general meetings, is co-sponsored by AGA and EEI.

Newsnotes

John F. Lynch, president, La Gloria Corp., Corpus Christi, was elected president of the Natural Gasoline Assn. of America at its annual meeting in Tulsa late in April. The Hanlon award, highest honor in the natural gasoline industry, was presented to Walter J. Podbielniak, president, Podbielniak Inc., Chicago, at the meeting.

AGA's industrial and commercial gas copy committee has announced a series of cash awards for gas company representatives who submit outstanding case history material for use in national advertising. Each case history accepted for advertising will be worth $10, and two grand awards of $100 each will be given.

Five cash prizes totaling $1000 are being offered for outstanding contributions in the field of gas househeating during the period from Sept. 1, 1950 to Sept. 1, 1951. The AGA contest is being sponsored by Coroaire Heater Corp., Cleveland, Ohio.

California Natural Gasoline Assn.'s 26th annual June Frolic will be held June 2 at the Rio Hondo golf club in Downey, Calif.

talk about room... you bet!

There's nothing like this exclusive "Staggered" Top

Nowhere else can your prospects find such a spacious, easy-to-use, 4-burner cooking top. Here is abundant room... easy access to each utensil... adequate working surface, as well. This sensational feature, coupled with Roper's many other outstanding advantages, gives you more real value to offer in a fine cooking appliance. Sell ROPER for use with any gas, including liquefied petroleum gas.

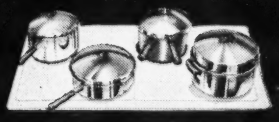
Gives You More "Sell" In

ROPER

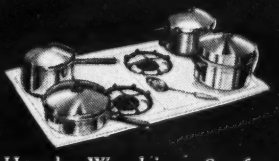
"America's Finest Gas Range"

Use All These King-Size Utensils at One Time

- 4-Quart Pressure Cooker
- 10½" Chicken Fryer
- 4-Quart Sauce Pan
- 5-Quart Dutch Oven

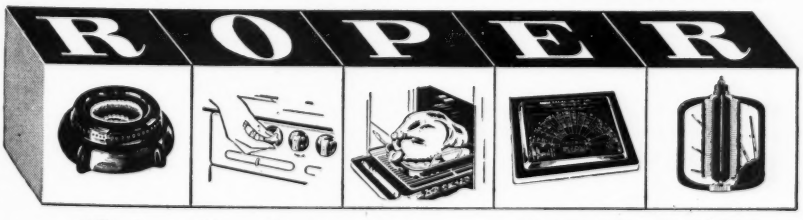


- An Unhampered Reach To Each and Every Utensil
- Utensil Handles Remain Cool... Easy to Manage
- Use Entire Top . . . with Lots of Room to Spare.



- Handy Working Surface Next To Each Burner
- Full 40 x 23" Area... All of Which Is Mighty Useful

Famous Roper CROWNING ACHIEVEMENTS



Alltrol "Center-Simmer" Burners	"Insta-Flame" Automatic Lighters	Large "Bake-Master" Oven	"Scientific" Cooking Charts	"Roper-Glo" Broiler Burner

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NEWS

Regulation

State's Right to Protect Utility's Market Upheld

Michigan Consolidated Gas Co. scored one major gain over its long-time adversary, Panhandle Eastern Pipe Line Co., last month, but on another front it was still bogged down.

The Detroit utility's gain came when the U. S. Supreme Court upheld the right of states to regulate the sale of natural gas piped across their borders if it is sold in competition with an established utility. The court thus backed up Michigan Public Service Commission, which had ordered Panhandle to obtain from it a certificate before beginning direct deliveries to the Ford Motor Co. plant at Dearborn.

Justice Sherman Minton wrote the 7-2 majority opinion. Justices Frankfurter and Douglas dissented.

Panhandle had contracted to sell 25 MMcf per day direct to Ford. But the commission invoked a state law which prohibits a public utility from selling service in a municipality already served by another without first obtaining a state certificate. Dearborn was already being served by Michigan Consolidated.

Michigan courts had previously upheld the commission's action. Panhandle, in its appeal to the highest court, held that no state has the power to prohibit such "interstate" sales. The commission contended it was not prohibiting, merely regulating, service. Justice Minton said Panhandle was asserting a right to "compete for the cream of volume business without regard for public convenience and necessity."

Meanwhile, Panhandle and Mich Con were filing final briefs before the Federal Power Commission on the question of whether Panhandle shall be permitted to reduce deliveries to Mich Con from 127 MMcf per day to 89.5 or shall be directed to increase present deliveries to 202 MMcf when their contract expires Dec. 31.

Texas House Passes Bill To Set Wellhead Price

One of five separate bills to set a wellhead price floor on Texas gas successfully passed through the state House of Representatives early last month and was on its way to Senate approval. By mid-month it had already been reported out by a 9-6 committee vote.

Tougher sledding might have been anticipated, however, as Lone Star Gas Co. and other opponents had only begun to marshall their forces when the house gave it a 72-43 passage.

The bill would authorize the state railroad commission to fix a fair price, by fields, in order to prevent economic waste. Proponents held it would also benefit chiefly small producers and royalty owners. Opponents said it would reap a heavy return for big operators, and would place in the hands of the commission a powerful political weapon.

Lone Star declared that it would cost Texas consumers $97 million a year and severely damage the state's economy. Vice President Chester May said it would boost the average price of 5¼ cents to 10 cents. Texas Independent Producers and Royalty Owners Assn. said it would not only stop waste but also head off wellhead price control by the FPC. Lone Star countered that it would likely bring on federal regulation. United Gas Corp. said it would be caught in a price squeeze as 90% of the gas it sells is resold on contracts which cannot be increased.

Most violent opposition came from those who felt it would be dangerous in that it would abrogate gas sales contracts. "If we want greater income for the state, let's tax it 3 or 4 cents," suggested Rep. Harold LaFont.

The railroad commission had previously denied that it had authority to set wellhead prices.

Texas Tax Bill Stymied

The Texas legislature finally approved and sent to the governor in mid-May a big spending bill, but it still hadn't solved the problem of where the money was coming from. Twenty million dollars was being sought from levies on natural gas, but the original version of this bill (*GAS*, May, p. 74) had meantime been amended completely out of shape.

When the house passed the bill, it incorporated proposals of Rep. Sewell to collect $28 million from a gathering tax. Estimates of how much taxable gas was being exported ranged from 46 to 62%. Succeeding amendments sought to narrow the taxable commodity to that being exported from the state.

The latest proposal, that of Sen. Kyle Vick of Waco, limited the levy to exported gas. The Vick bill would raise an additional 5% on the basis of long-term natural gas field contracts, with a minimum set for total tax at 1 cent per Mcf. A flat 10% had previously been suggested.

Some legislators expressed concern over the legality of the tax.

Defense Appointments Told

National defense agencies having to do with gas and oil are claiming the services of a number of prominent industry executives.

Among those recently appointed to the Petroleum Administration for Defense are Louis S. Sonnen, vice president in charge of purchasing for Tennessee Gas Transmission Co., Houston, as director of the gas facilities division; Charles E. Webber, on leave from the natural gasoline department of Sun Oil Co., Philadelphia, as director of the natural gas production and processing division; Walter E. Caine, vice president and treasurer of Texas Eastern Transmission Corp., Shreveport, as director of the gas planning division; and Charles T. Reichert, sales manager of National Supply Co.'s Oil Field Machinery & Equipment Division, Torrance, Calif., as chief of the drilling and production section, material division. George A. Wilson, president, Interstate Natural Gas Co. Inc., Monroe La., and F. T. Parks, vice president, Public Service Co. of Colorado, Denver, have been appointed members of the gas industry advisory council, and William S. Tarver, formerly assistant general counsel of the FPC has been named assistant general counsel of PAD.

Appointments to the National Production Authority include James S. Andrews, assistant general sales manager of Babcock & Wilcox Tube Co., Beaver Falls, Pa., as chief of the tubing section, iron and steel division, industries operations bureau, and Walter C. Skuce, on leave from Owens-Corning Fiberglas Corp., Toledo, as assistant administrator in charge of production controls and the controlled materials plan.

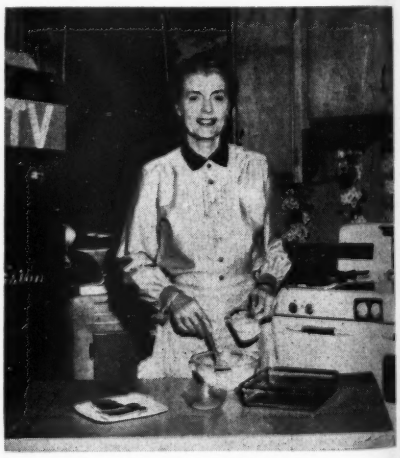
Cribben & Sexton Producing Packaged TV Cooking Show

Use of television to promote the advantages of modern gas cookery is still increasing.

Cribben & Sexton Co., Chicago, is sponsoring a new program to be produced in New York and packaged for distribution throughout the country. The 26-min. show, "Sally Smart's Blue Flame Gas Kitchen," is already scheduled for a number of stations and will be available without charge to any station. Basic aim of the program is to demonstrate the flexibility of gas in cooking.

In what may have been the longest continuous TV show sponsored by an appliance manufacturer, Cribben & Sexton also sponsored the telecast of Gen. Douglas MacArthur's Chicago visit. Eleven short commercials were included in the more than three-hour showing.

In Cleveland, East Ohio Gas Co. reports that 3000 letters a week are arriving at Station WEWS where Ethel Jackson, the company's commentator, handles an afternoon show. Gas for cooking is the principal product merchandised, but other sponsors include Fisher Foods of Cleveland, Bendix, Magic Chef, and Sapphire Flour.



Nancy Rowe, home economist, conducts "Sally Smart's Blue Flame Gas Kitchen," Cribben & Sexton-backed TV show.

NEW IMPROVED MODEL "B"

Longhorn Mobile Ditcher

Cost of Digging Small Ditches Tumbles When Using This Ditcher

Versatile: Fits almost any digging condition; usable in tight spots, being only 26" center of ditch to outside; hydraulic "Hip Action" permits vertical digging on slopes or level ground; can turn a ditch in a 12-foot radius.

Mobile: As a light tractor; road speed of 20 miles per hour.

Economical: One-man operated; operating and repair costs surprisingly low.

Speedy: With a ditch marked off the machine swings into position, boom is lowered and digging is from 1 to 25 feet per minute, depending on soil and depth of ditch.

Compact: Without moving from his seat operator drives machine, adjusts "Hip Action," raises or lowers boom and reverses soil conveyor.

Safe and Rugged: Practically all gears are covered with removable housings; drives are on sealed ball bearings; chassis is borne on Timken tapered roller bearings; gears run in oil.

Quick Repair: The Longhorn Mobile Ditcher is built as a unit design, and unit replacement parts are always available for immediate delivery; removal and attachment of unit replacement is a simple operation.

To have complete information about the Longhorn Mobile Ditcher is to realize that this machine is unequalled for digging small ditches.

Your request for information will receive our prompt attention.

LONGHORN INDUSTRIES, INC.

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Commission Named to Study Southwest's Gas Problems

Gov. Johnston Murray of Oklahoma has appointed a five-man commission to study the entire natural gas situation in Oklahoma and has asked that Gov. Allan Shivers of Texas and Gov. Edward Arn of Kansas name committees to meet with this group to devise a way to check the flow of natural gas northward.

Governor Murray stated that 80% of the world's output of gas is produced in Texas, Oklahoma, and Kansas, most of which is sent through pipelines to big industrial sections in other parts of the nation, and that conservation of natural gas supplies in the southwest is vital in order to hold the population of the area.

Directors of the Dallas chamber of commerce also have asked for a halt in the export drain of Texas gas, claiming that it is the basis of industrial economy in the state.

Storage Bill Introduced

A bill to give the state commissioner of conservation and economic development control over underground storage of gas or petroleum products was introduced in the New Jersey legislature late in April.

The legislation was offered as a substitute for an earlier bill to outlaw such storage, prompted when state water authorities objected to storage plans of Transcontinental Gas Pipe Line Corp., Houston, on the grounds that water supplies would be contaminated. At a public hearing, state conservation authorities agreed to lift their objections if such storage were supervised by the state.

Transco plans to store gas during the summer in pockets in wooded areas of Burlington and Ocean counties in central New Jersey.

Depletion Remains at 27.5%

Last month the House ways and means committee voted to leave the oil and gas depletion allowance at 27½%. The Treasury department had requested a cut to 15% and reportedly had an alternate scheme in the works, designed to maintain the 27½% figure for stripper wells and to reduce to 15% the allowance for flush wells.

Rep. J. M. Combs, Beaumont, Texas, who is a member of the House committee, said the action was tentative, but he was confident it would stand on a final committee vote.

Newsnotes

The Supreme Court has ruled that Montana-Dakota Utilities Co. had "no cause of action" in a damage suit against Northwestern Public Service Co. for what it claimed were fraudulently unreasonable rates charged by Northwestern. A district court awarded Montana-Dakota $779,958 damages, an appeals court threw the case out on the grounds that it should have been presented to the FPC, and the Supreme Court said FPC does not have jurisdiction but split 5-4 over whether Montana-Dakota had any method at all of collecting the damages.

Suggestions have been renewed that the FPC collect fees to help defray expenses in connection with the granting of licenses to natural gas companies. FPC Chairman Mon C. Wallgren recently told a House appropriations subcommittee that he thought such fees should be collected. The commission's budget request includes $21,000 for work in gas rate cases and an additional $17,500 for issuing certificates of public convenience and necessity in natural gas cases.

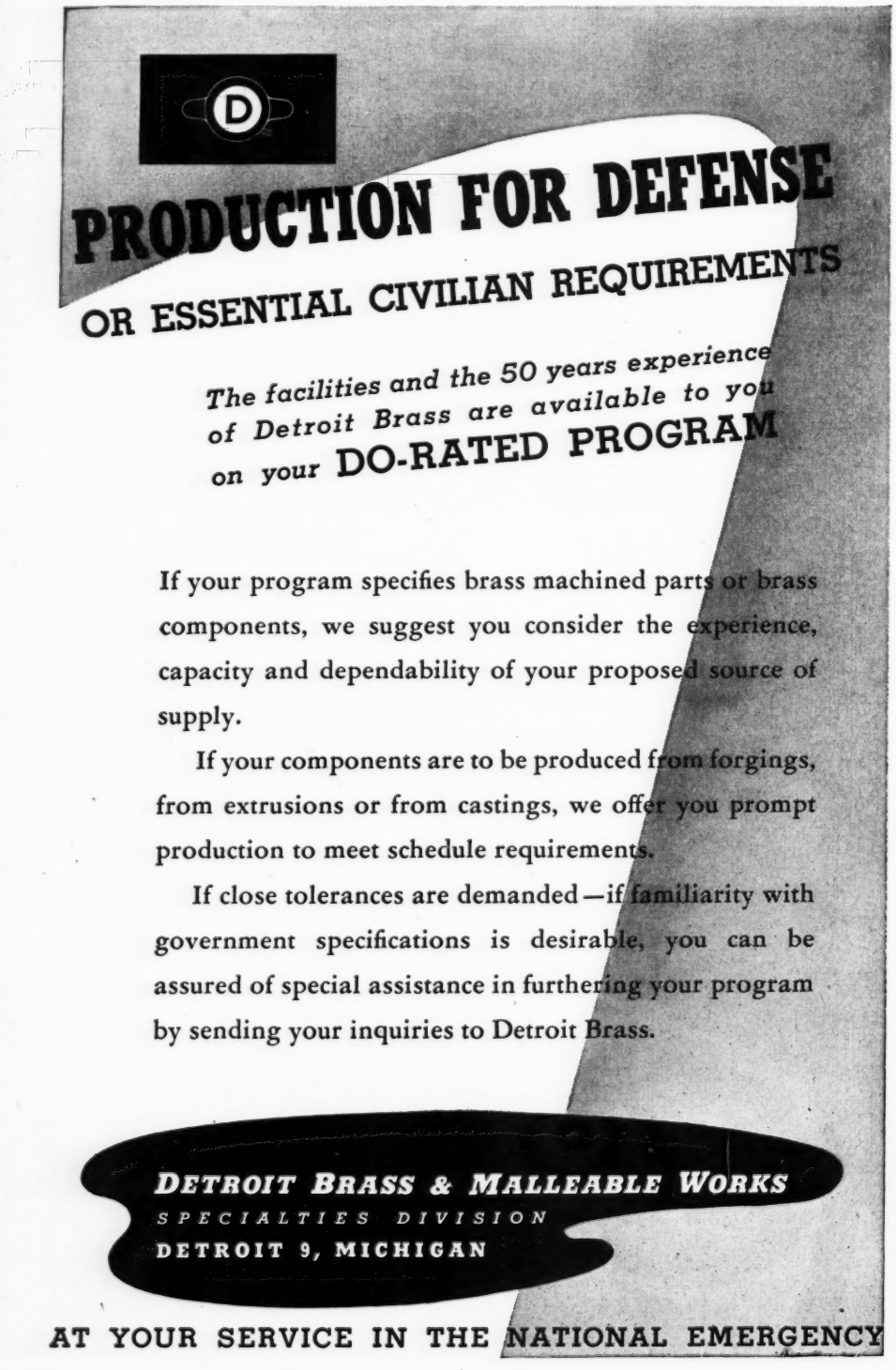
Mon C. Wallgren has announced that he will resign as chairman of the Federal Power Commission "sometime this summer." President Truman appointed him to the post in November 1949. Mr. Wallgren, former governor of Washington, will return to his home in that state.

Load Building

Househeating Demand Steady, AGA Predicts

There will be no letup in demand for gas for househeating this year or next, the AGA has discovered.

In the latest of its periodic surveys of anticipated additions to comfort equipment on gas utility lines, the association learned that 1 million new customers are expected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OR ESSENTIAL CIVILIAN REQUIREMENTS
The facilities and the 50 years experience of Detroit Brass are available to you on your DO-RATED PROGRAM
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THE *NEWEST* TITAN CONTROL for Dependable Water Heater Operation

For use with NATURAL GAS
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Featuring: LARGER CAPACITY • GREATER EFFICIENCY • GREATER SAFETY

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to be added before the 1951-52 heating season, with another 900,000 anticipated for the 1952-53 period.

As of Jan. 1, nearly 9 million customers were already using gas for this purpose.

New pipelines are providing the impetus for this strong growth, the AGA has concluded. Returns showed heaviest saturation increases in California, the middle Atlantic, and east north central areas of the United States—all of which are beginning to benefit, or will soon benefit, from pipeline completions. The only states in which activity is expected to slacken off are certain ones in the west central sector.

The survey covered 290 gas utilities serving 20,407,000 residential customers as of Jan. 1, this representing about 90% of all residential users in the nation. Exact estimates totaled 919,000 for the coming year, 811,000 for 1952-53; these figures were extended by AGA statisticians to give a 100% prediction.

Results were reported by states. Wisconsin, Indiana, and Flordia showed the highest anticipated percentage growth. Wisconsin expects to add 75,000 in two years to its present total of 41,000. Indiana will double its load in two years, Florida will nearly triple its saturation.

CALENDAR

JUNE

Institute of Cooking and Heating Appliance Manufacturers Annual Meeting—Cincinnati, June 5-6.

AGA Executive Conference—Greenbrier hotel, White Sulphur Springs, W. Va., June 11-12.

Canadian Gas Assn.—Bigwin Inn, Lake of Bays, Ontario, Canada, June 18-21.

New York-New Jersey Regional Gas Sales Conference, Residential Gas Section—Spring Lake Beach, N. J., June 19-20.

Michigan Gas Assn.—Grand hotel, Mackinac Island, Mich., June 25-26.

JULY

American Society of Heating & Ventilating Engineers Semi - Annual Meeting—Portland, Ore., July 2-4.

SEPTEMBER

Pacific Coast Gas Assn. Annual Convention — Fairmont hotel, San Francisco, Sept. 4-6.

New Jersey Gas Assn. Annual Meeting—Monmouth hotel, Spring Lake, N. J., Sept. 7.

Maryland Utilities Assn. Fall Conference—Virginia Beach, Va., Sept. 22-23.

OCTOBER

Texas Mid - Continent Oil & Gas Assn. Annual Meeting — Beaumont, Texas, Oct. 8-9.

39th National Safety Congress & Exposition of the National Safety Council—Chicago, Oct. 8-12.

AGA Annual Convention—St. Louis, Oct. 15-17.

National Metal Congress and Exposition—Detroit, Oct. 15-19.

NOVEMBER

American Society of Mechanical Engineers—Chalfonte - Haddon Hall, Atlantic City, Nov. 25-30.

DECEMBER

Institute of Cooking and Heating Appliance Manufacturers Semi-Annual Meeting—Cincinnati, Dec. 3-5.

Utility Merchandising Cut; New Dealer Plan Effected

In an effort to increase an already strong saturation of gas appliances in its service area, Southern Counties Gas Co. of California is withdrawing further from the field of active merchandising and is effecting a new and more intensive dealer cooperation program.

In a move that is apparently counter to the trend, and at a time when dealers have certain appliances practically "coming out of their ears," the Los Angeles utility contemplates that its dealers can and will do a better job for gas if the company abandons its field selling forces and throws stronger support behind them.

What effect would the elimination of this force have on the overall sales in the area? General Sales Manager Frank Seitz looks at it this way:

"Of all the sales made by the company's field selling force, 95% would have been made by a dealer anyway. Salesmen on an incentive pay plan will naturally go after those sales that are easiest to make, whether they work for Southern Counties or for a dealer."

At worst, then, the utility would lose no more than 5% of the sales potential. But the worst, of course, is not anticipated. It is expected that with the added support for dealers, plus the removal of this competition provided by the utility's salesmen, total sales will increase.

The real merchandising function of the utility, as Mr. Seitz sees it, is to swing the highly competitive sales. The dealer himself, given every possible break in the form of sales aids and the removal of the competition of gas company field salesmen, can and will increase that 95% figure. With the advantageous profit margin afforded on gas appliances and the active dealer contact program planned, he will have greater incentive to push such sales.

"Our dealer contact men are going to help the dealer make the cash register ring more often *and* more loudly," he declares. He believes dealers can be made to see the benefits that will accrue to them if they actively work to upgrade gas appliance sales.

The heavily competitive sales—the creative sales, the doorbell-ringing type that will bring in business where ordinary dealer work will not—are not encompassed in the program as it is currently being set up. These are properly within the province of the utility; their prosecution is the job of utility field men. How to organize such a program has not as yet been decided. It is evident that such sales were not being made in sufficient quantity; so withdrawal of field sales forces at this time is not expected to have any material effect.

It is obvious, however, that eventually a program to cover this phase will have to be set up.

Direct beneficiary of the new plan will be the dealer salesman. Under the old system, prospects reported by gas company employees in the company's perpetual prospecting plan were given to one of the utility's salesmen. If he closed the sale, it was turned over to the dealer, with a 10% selling commission. The dealer's own men were bypassed. Now prospect slips will be given directly to the dealer; his own salesman may follow through, and the commission for closing the sale will be his.

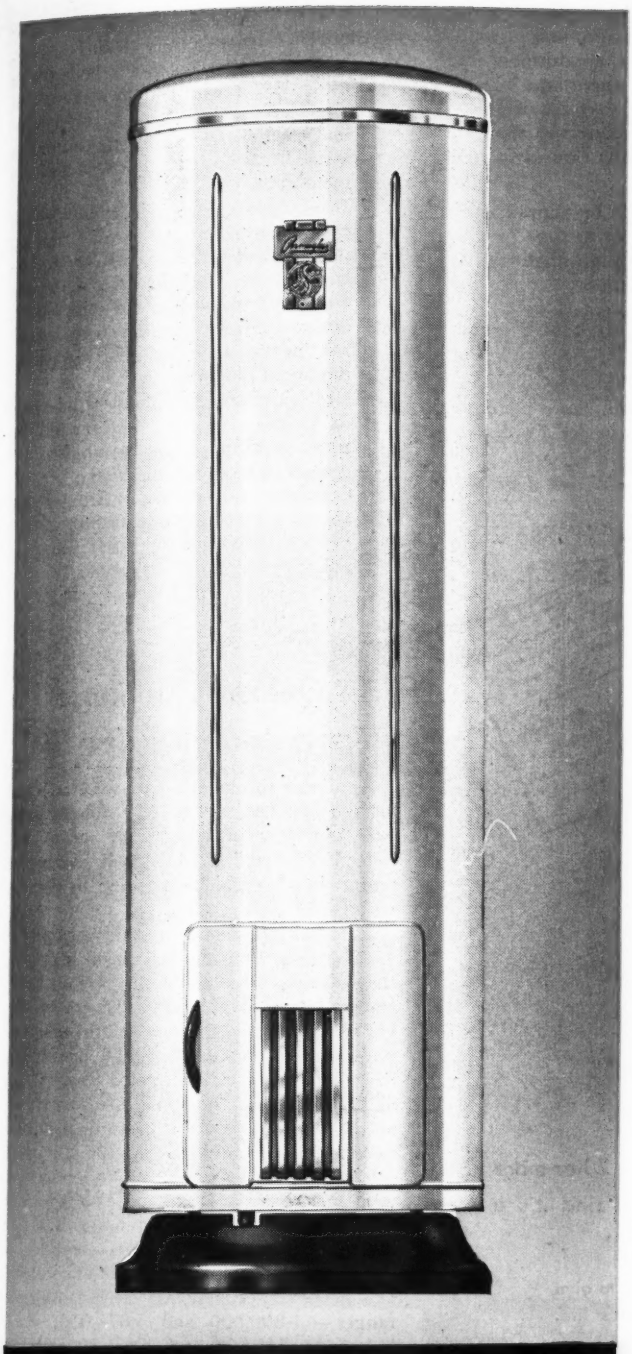
Southern Counties' prospect program will continue to function as before, with a 1% commission being awarded to employees whose job entails direct customer contact, 2% to those whose jobs give them no direct contact.

Southern Counties is approaching the program with the attitude, "We need help in getting gas appliances on our lines. How can we help you (the dealer) to help us?" The policy, being effected June 1, will be introduced without fanfare. No extravagant promises will be made. No rigid specifications for carrying out the various aims have been established. New ideas from all segments of the business, from manufacturer to retailer, are being welcomed. (First to be approached were manufacturers and executives of trade associations, who met May 24 with utility sales executives.)

Key man under the 12-point sales policy will be the dealer contact man. Thoroughly schooled in such matters as sales techniques, advertising, product demonstrations, display, marketing, etc., he will promote the use by dealers of the supports and assistance offered by the company and will keep dealers informed of company policies and practices. He will secure sales reports from dealers, as well as information pertaining to the effectiveness of the program, marketing conditions, etc. His "regularized dealer contact" is expected to assure success for the policy.

The following 12 points comprise the program. The first two will be effected immediately; the other 10 will be set in motion as the plan develops:

1. Prospect leads will be distributed equitably on a geographic basis, in accordance with the dealer's over-all promotion of gas appliances.
2. Sales will be distributed on the same basis as prospect leads. These sales, generally made by special representatives in their new construction contacts and appliance counsellors and others covering display floors, will be offered to dealers for a 10% selling commission.
3. Effective sales promotional campaigns and contests will be developed periodically. Window and floor display and other promotional materials, supporting these campaigns and contests, will be furnished free or at a nominal cost.
4. Direct mailing service will be furnished, including addressograph service, using direct mail pieces furnished by the



Permaglas Automatic GAS Water Heaters are available in a complete array of sizes: 20- and 30-gallon Special Models; 20-, 30-, 45-, 60- and 75-gallon *Permaglas* to satisfy any domestic water heating requirement.

Large size Permaglas water heaters

ACTUALLY COST LESS

than ordinary water heaters!

For months you've had the news that *Permaglas,* the automatic water heater with glass-surfaced steel tank that can't rust because glass can't rust, *costs no more* than ordinary water heaters.

Actually, the larger sizes of *Permaglas cost* LESS *than ordinary water heaters!* Yes, they're big—with proportionate profit to you!

This triumph, of A. O. Smith manufacturing methods, means that wherever a large size water heater is required you can now supply and install this finest of all for LESS!

Makes the value of a Registered A. O. Smith Dealer franchise greater than ever!

Smart merchandisers investigate A. O. Smith and sell adequate sizes . . . today there's greater need than ever for more hot water in every home with the growing popularity of new hot water consuming appliances.

Get all the facts back of this incredible news at once. Write or use the handy coupon today.

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dealer or developed by the company. Mailing lists for followup field calls by the dealer will be furnished.

5. Sales training will be offered to dealers and their salesmen, either in their stores by the conference method, or in groups by lectures and demonstrations, as will installation and adjustment training for their installers and servicemen.
6. Effective home service assistance will be made available, such as providing home service directors for dealer sales floor demonstrations and cooking schools, scheduling demonstrations in company auditoriums to which purchasers and prospects may be invited, and making home calls on customers at the specific request of dealers.
7. Gas appliances will be displayed by the company in community and county fairs, exhibits, shows, expositions, etc., that are of sufficient importance to warrant such display. If they are of minor importance, the company will share in the dealer's cost if any care to participate.
8. Dealer bulletins will be supplied for distribution from time to time providing sales tips, market information, and other matters of importance to the dealer.
9. Kitchen planning service will be offered through the dealer for his customers who plan to build new homes or remodel existing ones. Store planning and layout will be provided for dealers who are building or remodeling their stores. A small supply of kitchen planning questionnaires should be left with those dealers who care to make use of this service. Completed plans will be sent to the division for transmittal to the dealer who should present them to the customer.
10. Top quality gas appliances will be displayed on company floors. The appliances will be representative of those handled by dealers in the vicinity who are cooperating with the company. A dealer directory, naming these dealers, will be available for referring parties interested in appliances.
11. Newspaper cooking schools will be held in various communities from time to time, providing tie-in possibilities for dealers in those communities.
12. Company advertising schedules for newspapers will be furnished so that dealers can exploit such advertising by inserting tie-in advertisements.

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Check the Records

Just look for the service record showing 10, 15, 20 or more years of accurate service in the meter. You'll find it's a Lancaster Metal Rim Diaphragm.

Lancaster Metal Rim Diaphragms are quality made to give you better meter performance and longer service life.

Just look for the metal rim diaphragm without a wrinkle or fold around the rim edge where the leather is tucked into the metal. You'll find it's a Lancaster Metal Rim Diaphragm.

Lancaster Metal Rim Diaphragms are not wet, blocked or stretched . . . they have no rim or port hole leaks.

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Write today for sample and literature. No obligation.

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POST OFFICE BOX 378 . . . LANCASTER, OHIO

Miscellany

First Quarter Appliance Shipments Reach New High

Appliance shipment figures for March and for the first quarter of 1951 showed gains over last year in number of ranges and water heaters and a reduction in number of central heating units, according to GAMA reports.

In March gas water heater shipments were 38% greater than during the same month last year, gas range shipments were up 14%, and gas burner shipments were down 34.8%. For the quarter, several new records were set: water heaters totaled 680,000, up 47.7% from 1950, and ranges totaled 813,000, up 27.5%. Both were all-time quarterly highs. Shipments of central heating equipment during the three months reached 163,400 units, .8% less than the same period last year.

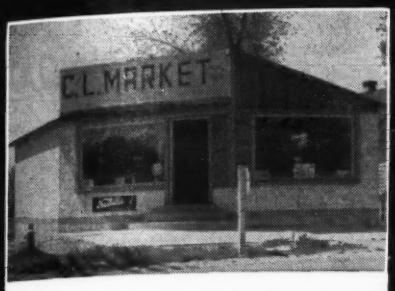
Estimated unit sales of these appliances for 1946-50 and number of appliances in use at the end of each year have been compiled in another GAMA report. Total sales for 1946 and 1950, respectively, are listed as follows: ranges — 1,800,000 and 3,023,000; water heaters—1,743,000 and 2,561,200; central heating equipment—662,500 and 1,019,500; floor and wall furnaces—328,000 and 595,000; direct heating equipment—1,250,000 and 1,993,000.

Storage Project Submitted

A standby plant near Rockville, Md., to hold 70 MMcf of natural in underground storage and 30 MMcf of propane-air gas aboveground, will be built by Washington (D. C.) Gas Light Co. if the FPC approves an application submitted late in April.

Should the company's supply from Atlantic Seaboard Corp. fail, the $7.1 million plant would supplement existing standby facilities, which have a delivery capacity of 50 MMcf for the first day of an emergency, enough to supply the system for only a few hours on a peak day.

Although the company expects to begin construction in July and to complete it next



Mr. Cleon Lee, C. & L. Market
Logan, Utah
Says:—We are very thrilled with the clean efficient heat our Empire Floor Furnace gives us. We have become the envy of a great many of our grocery customers.

Mr. Tyman Jackson,
Twin City Motor Court
New Brighton, Minnesota
Says:—We have 30 Empire Floor Furnaces installed in our cabins and, outside of the very economical cost of operation, the most satisfying feature is the almost total lack of service required to keep them operating efficiently.

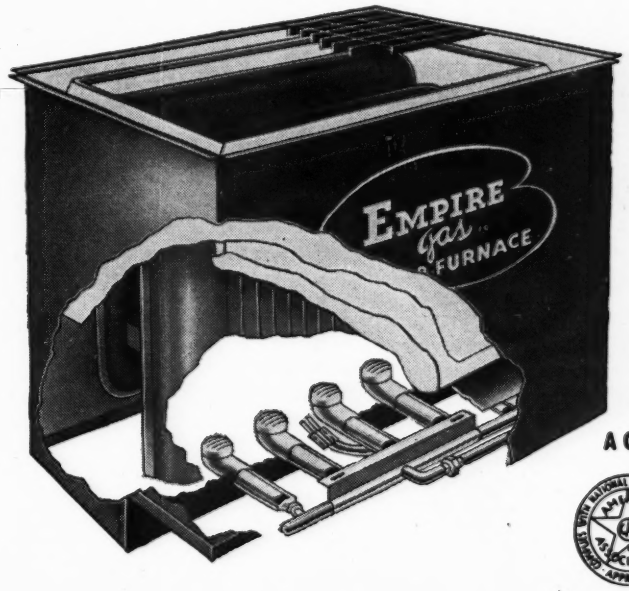
Mr. John W. Mosteller
Cherryville, North Carolina
Says:—The Empire Floor Furnace installed in my house has been in continuous service during the heating months and doing a wonderful, quick, clean, noiseless job at an amazingly low cost.

INSTALL EMPIRE
AND
HAVE SATISFIED CUSTOMERS

WITH

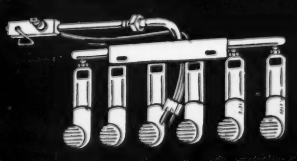
EMPIRE GAS FLOOR FURNACES

- EASY TO INSTALL
- ECONOMICAL TO OPERATE
- LOW FIRST COSTS
- NO BASEMENT NEEDED
- NO AIR DUCTS REQUIRED
- NO EXPENSIVE EXCAVATIONS



AGA APPROVED

THE FAMED *"Thriftmatic"* *Gas* BURNER "EXCLUSIVE WITH EMPIRE"



Developed to burn gas, the only fully automatic fuel, the new Empire Gas Burner will burn Natural, Mixed, or L-P gases.

SEE YOUR LOCAL EMPIRE REPRESENTATIVE OR WRITE DIRECT TO EMPIRE

EMPIRE STOVE COMPANY
BELLEVILLE, ILLINOIS
WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

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spring, the application stated that part of the storage facilities would be available for use by Jan. 1.

Peak Shave Plant Planned

Southern Union Gas Co., Dallas, has announced plans to build a $600,000, 270,000-gal. butane-propane peak shaving plant at Albuquerque, N. M.

The 10-tank installation, to be built by J. F. Pritchard Co., Kansas City, is designed to supply the city with 1 MMcf per hour of mixed gas. Butane-propane will be hauled during the summer from Southern Union's gasoline extraction plant at Bloomfield, N. M.

Albuquerque's peak lead problem began about two years ago as a result of the post-war building boom—10,000 new dwellings since 1945.

P. W. Martin, general superintendent for Southern Union, will supervise construction of the plant and will have charge of its operation.

Dealer Bulletin Published

Portland (Ore.) Gas & Coke Co. recently began publication of a new bulletin, *Blue Flame Dealer News.*

Company and industry news, sales hints, and display ideas were prominently featured in the first issues.

Matchless
in
Quality and Durability
WELSBACH-Kitson
Gas Stops and Valves
G-453
Welsbach High Pressure service gas valves. Tamper-Proof, Sealed-in Assembly is Available in Sizes of 1" Inlet by 1" Outlet, and 1" Inlet by ¾" Outlet.
G-490
I. P. Male. Flathead Roundway Gas Stop, High Pressure Service, for Underground Service Mains. Made of Gas Service Bronze.
G-491
Flathead, Male & Female Pipe. Roundway Gas Stop, High Pressure Service, for Underground Service Mains. Made of Gas Service Bronze.
... and add to quality and durability, the precision that is built right into every WELSBACH-Kitson product. For more than 50 years, these dependable products have been leaders ... leaders because every one of the whole line (only a few are shown here) is made with "built-in" dependability. Write for the complete WELSBACH-Kitson catalog ... today.
Send for the Catalog Today
The WELSBACH CORPORATION
Kitson Division
1500 Walnut Street
Philadelphia 2, Pa.

Portland Gas also announced a contest for salesmen with the best "pitch" and for those who know the most answers to questions about modern gas ranges. First winners of cash awards for their sales reports were announced in the April 26 issue of the new publication.

Newsnotes

Piedmont Natural Gas Co., Spartanburg, S. C., last month took over Duke Power Co.'s gas manufacturing and distributing operations in Charlotte, Greensboro, High Point, Salisbury, Winston-Salem, Burlington, and Mt. Airy, N. C., and Spartanburg, Greenville, and Chester, S. C. When pipe is obtained, Piedmont will build laterals to these cities and serve them with natural gas.

The city commission in Miami, Fla. recently took the initial steps toward acquiring the local properties of Florida Power & Light Co. and Miami Gas Co. The commission is considering a survey to assist the city to negotiate or take the necessary legal action to acquire the utilities' properties by purchase or condemnation.

Gas sales in March 1951 showed an increase of 12.6% over the 4215 million therms sold in the same month last year, AGA has reported. During the 12 months ended March 31, 1951, gas utility sales rose to 44,190 million therms, up 17.8% from the previous 12 months. During March, natural gas sales were 14.3% over March 1950, and manufactured and mixed gas sales declined 4.7% from a year ago.

The home service staff of Manufacturers Light & Heat Co. and associated Pittsburgh Group companies set a 1950 record of 6115 home calls, 1184 more than during the preceding year. Of the total, 1052 were gas-fired clothes dryer calls and 497 were on clock-controlled ranges. Six home economists were added to the staff during the year.

At the request of the Economic Cooperation Administration, the American Standards Assn. is surveying its 2200 members in an attempt to determine the money savings resulting from the adoption of all kinds of standards. The study will include, in addition to ASA standards, those of trade and technical associations, industrial groups, and private companies.

A battery of 20 new coking ovens is under construction by Milwaukee Solvay Coke Co., a subsidiary of Milwaukee Gas Light Co. The $1.2 million project is scheduled for completion by December. Plant capacity for producing coke, tar, and various coal derivatives will be upped 10%.

A certificate of cooperation recently was awarded to H. Emerson Thomas & Associates Inc., Westfield, N. J., by the ECA. The citation was for "assistance in giving technical aid to western European countries under the ECA program."

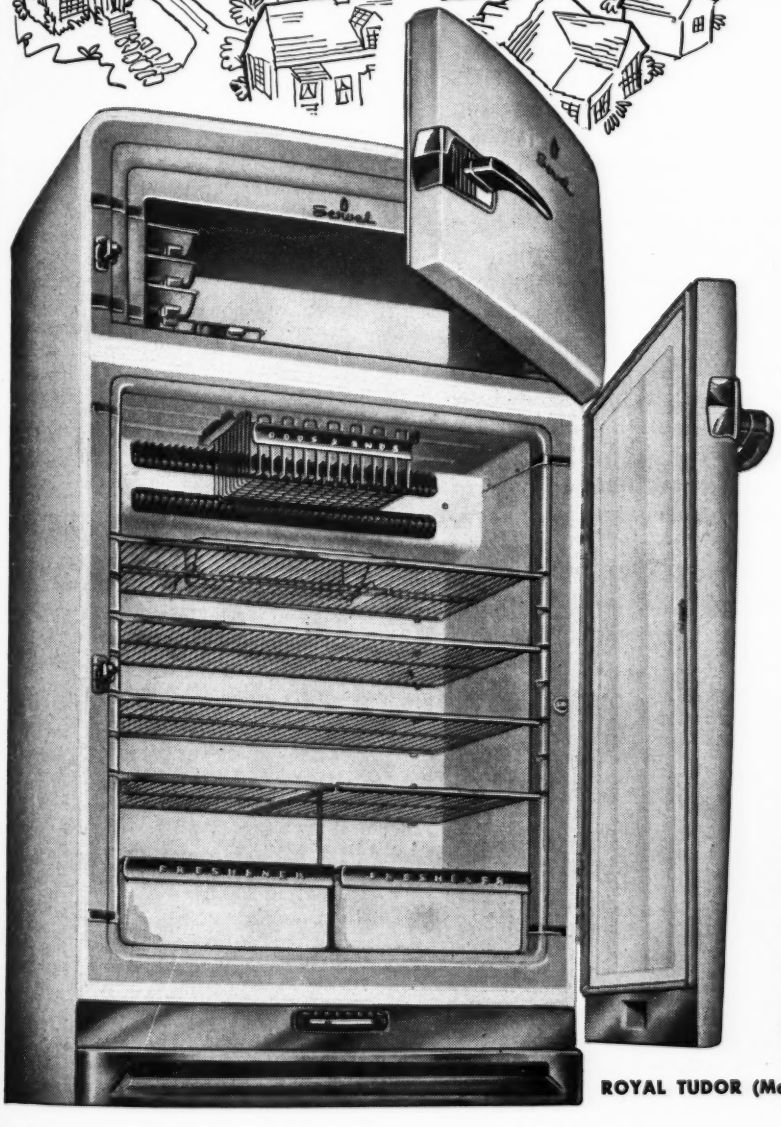
Lynchburg (Va.) Gas Co. is 100 years old this year. A recent 12-page Sunday supplement to the Lynchburg *News* consisting of a history and pictorial review, gave recognition to the company's centennial.

Now, every kitchen in town is your market with the new SERVEL

WHOLE new sales horizons are opened up with the marvelous new Servel. It was designed to make anybody who uses a kitchen your prospective customer. This dynamic refrigerator is head and shoulders above its closest competition. Engineering changes have made it much larger inside, yet smaller outside. And there are *eight* strikingly handsome models to choose from—one for any size home or family.

Sovereign of the new Servel line is the incomparable Royal Tudor with a huge 11.5-cu. ft. volume. It's really two refrigerators in one—a separate 2-cu.-ft. freezer compartment plus a 9½-cu.-ft. space for other foods. This magnificent Servel has just about every luxurious convenience homemakers could ask . . . feather-touch Bulldog Latches that click shut by themselves...twin glass-covered Dew-Action Vegetable Fresheners...Quick-Change Shelves that adjust easily to accommodate bulky foods. There's even a thoughtful "Odds and Ends" Basket to store small jars and packages.

In addition to all these competition-stopping advantages, Servel gives you its silent, motorless freezing system the only freezing system guaranteed for *ten full years!* Right now's the time to really push the great new Servel line. With hot summer weather causing more electric refrigerator breakdowns, the replacement market will be wide open. So take advantage of this wonderful opportunity. For suggestions write Servel, Inc., Dept. I-16, Evansville 20, Indiana.



ROYAL TUDOR (Model BR-1118)

STAYS SILENT . . . LASTS LONGER

Servel

The GAS Refrigerator

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NEW PRODUCTS

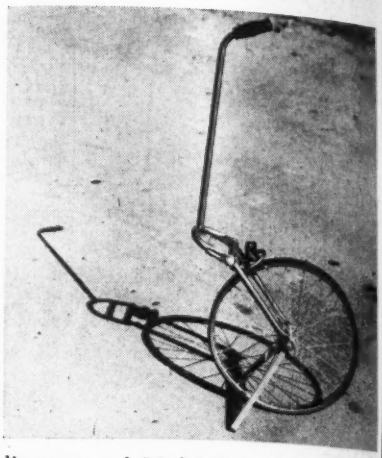
Measuring Wheel

ROLATAPE INC., Santa Monica, Calif.

MODEL: No. 400 Rolatape.

APPLICATION: For use in physical inventories, leakage surveys, street opening surveys, locating paving cuts, main extension measurements, map corrections, and general estimating work. It will measure around corners and over contours.

DESCRIPTION: This wheel has a 4-ft circumference and registers distances up to 100,000 ft, then repeats cycle. Handle of this 5-lb model folds compactly so wheel can be carried and stored in car or truck. Stand holds wheel upright while operator is logging data, without losing count of distance. The Model 400 can also be operated from a car. In addition, Rolatape manufactures Model 200 (2-ft circumference) for shorter distances, and Model 600 (6-ft circumference) for longer distances and rougher terrain.

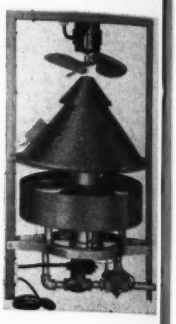


from gas field to house service it's

CLEVELANDS ALL THE WAY

For 30 years the gas industry across the nation has picked CLEVELANDS for the full spread of gas trenching work—from the big CLEVELANDS out in front on the transcontinental pipelines to their smaller brothers on gathering lines in the field and house services in the cities. This continuing acceptance is based on owners' experience that no matter how tough the soil and terrain conditions, no matter how cramped and difficult the digging locations, no matter how tight and scattered the schedules—CLEVELANDS can be relied on for a better, faster and cheaper job. Get the full story today. See your local distributor or write The Cleveland Trencher Co., 20100 St. Clair Avenue, Cleveland 17, Ohio.

Industrial Heater



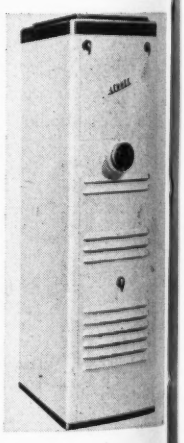
H. G. LANDIS HEATER CO., 1772 W. Vernon, Los Angeles 62, Calif.

MODEL: Overhead industrial heater.

APPLICATION: For supplying even heat (circulating and radiant) to large industrial areas.

DESCRIPTION: This AGA-approved suspended heater features 100% automatic safety pilot, snap-acting solenoid and electric switch, optional thermostatic control, and automatic gas pressure regulator. Grids are cellular, stainless steel heating elements built above each burner to promote secondary combustion. Gases not burned originally are consumed as they pass through the grids, assuring complete combustion and producing, according to the manufacturer, clean, odorless, radiant heat.

Furnace



LENNOX FURNACE CO., Marshalltown, Iowa.

MODEL: Gas-fired, reverse flow Hi-Boy.

APPLICATION: For perimeter heating in basementless homes.

DESCRIPTION: This complete winter air conditioning unit has a rubber mounted blower, steel body and heat exchanger, air filter, built-in warm air plenum, and automatic humidifier. In addition to a limit control in the warm air plenum, it has a limit control just under the blower and above the heat exchanger to prevent excessive heat from rising when the blower is not running. The cabinet is 21½ in. wide, 27¼ in. deep,

and 72 in. high. Return air can be taken in the top or high on either side; warm air comes out at the bottom. Btu input is 65,000.

Commercial Broiler

DETROIT MICHIGAN STOVE CO., Detroit 31.

MODEL: Garland.

DESCRIPTION: Improvements in this latest Garland commercial broiler include a 14-in. back flue that provides more positive and effective control of smoke vapors, "floating" grid rods that can expand under intense heat to prevent warping, newly designed exterior with unbroken front that permits easier, faster cleaning; and deeper oven area. Heavy ceramic radiants distribute intense heat from two separately controlled multi-port burners.

Gas Range

PHILLIPS & BUTTORFF MANUFACTURING CO., Nashville, Tenn.

MODEL: Enterprise.

DESCRIPTION: Featured model of a new line of 15 is the DeLuxe Hi-Broiler with automatic oven and broiler ignition. The waist-high broiler rolls out when the door is opened, and the one-piece broiler body can

be removed for easy cleaning. An oversize oven, designed for balanced baking, has one-piece porcelain lining and non-tip oven racks, as well as a glazed door and inside light. Depth accommodates large roasters. Top burners — two giant and two standard-size on 10-in. centers — are cast iron with aluminum alloy non-clog heads.

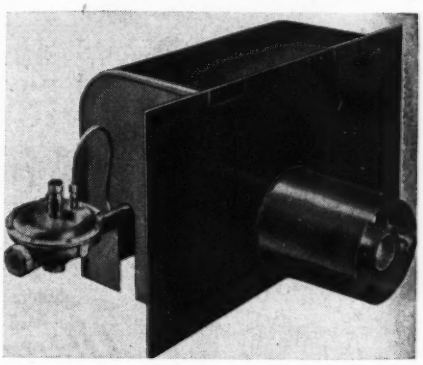
Gas Burner

DELTA HEATING CORP., 85-07 Northern Blvd., Jackson Heights, New York, N. Y.

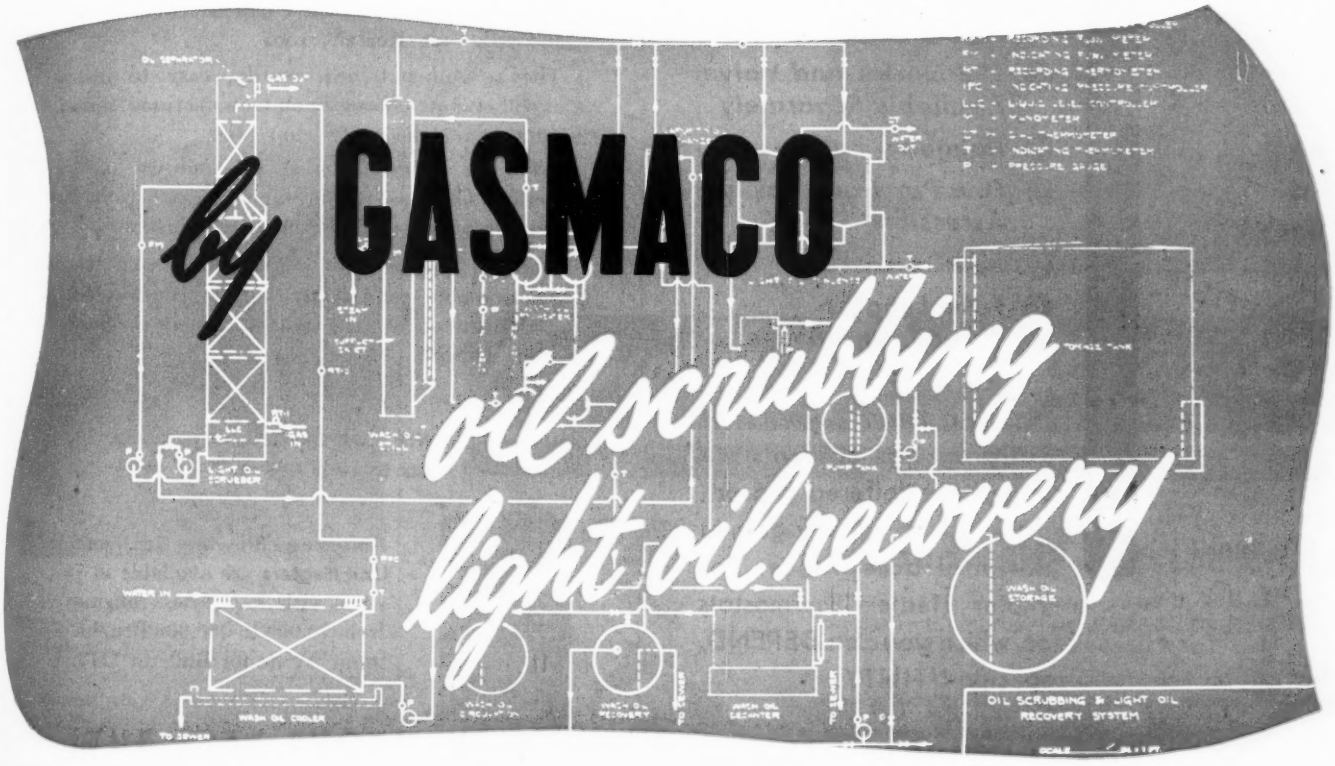
MODEL: Inshot, gun-type gas burner.

APPLICATION: For use in all types of heating and process boilers, furnaces, and large cook stoves. Especially adaptable for use in wet base boilers with low crown sheets, and as a replacement for oil burners.

DESCRIPTION: No combustion chamber or refractory base is required, and installation



can be made in less than 15 minutes, according to the manufacturer. A runner pilot is provided on all sizes to permit lighting the burner from outside the furnace. Three sizes range from 80,000 to 300,000 Btu.



THE GAS MACHINERY COMPANY

16108 WATERLOO ROAD
CLEVELAND 10, OHIO

Designers • Fabricators • Erectors
Gas Plant Equipment and
Industrial Furnaces

THE GAS MACHINERY CO. (Canada) Ltd.
HAMILTON, ONTARIO

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UC-1 Thermostat

"V-1" Valve

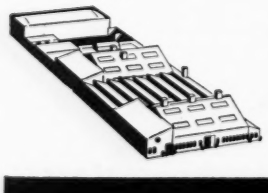
A FINE NAME IN WATER HEATER *Thermostats*

Utility

1. *Long Trouble-Free Service Life*
2. *Thermostat and Valve Available Separately*
3. *Ruggedly Built*
4. *Few Parts and Easily Accessible*
5. *Built to Last*
6. *Tube Lengths 4⅜, 6½ and 8½ in.*

In over twenty years of building gas controls we have never offered a product which so rapidly gained national acceptance. For Water Heater Thermostats on which you can DEPEND, specify UTILITY.

Certified by A.G.A.



THE UTILITY CONTROL COMPANY FACTORY

Utility CONTROL COMPANY

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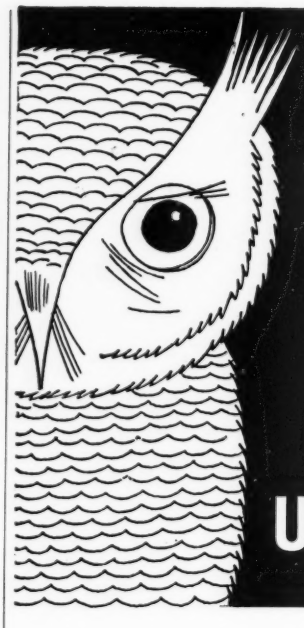

Now you can get American Blower Gas-Fired Unit Heaters

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And that really pleases us when it concerns American Blower Gas-Fired Unit Heaters.

Already people are saying—"We like the way they're built . . . the rugged construction . . . the baked-enamel finish . . . the aluminized steel combustion chamber which withstands high temperatures" and . . . "We like the swell heating job they do . . . and the savings in our fuel bills."

We're sure you'll like these new American Blower Gas-Fired Unit Heaters, too.

They're self-contained, sturdy, easy to install and will operate efficiently on manufactured, mixed, natural or liquefied petroleum gases.

All units carry the seal of approval of the American Gas Association—and are backed by our 70-year reputation in the heating industry.

Data on American Blower Gas-Fired Unit Heaters is available from Heating Supply Houses, Heating Contractors or the nearest American Blower Branch Office.

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American Blower Gas-Fired Unit Heaters are available in 7 sizes with capacities ranging from 70,000 to 230,000 Btu/hr. input. Write for Bulletin 7117.

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ABSTRACTS

Presented in the following items are abstracts of papers delivered at the 7th annual meeting of the National Assn. of Corrosion Engineers, held March 13-16 at New York's Hotel Statler.

MAGNESIUM ANODES FOR CORROSION CONTROL IN HOT WATER STORAGE TANKS—by H. A. Robinson.

Galvanic protection of hot water storage tanks with magnesium anodes has been investigated for various types of tank constructions and protective lining materials. Preliminary work was done with steam-heated industrial type water heaters having black iron or bare steel tanks. Subsequently, the investigation was expanded to include the study of domestic type water heaters having galvanized tanks. Automatic gas, automatic electric, and range boiler type water heaters were included in these tests.

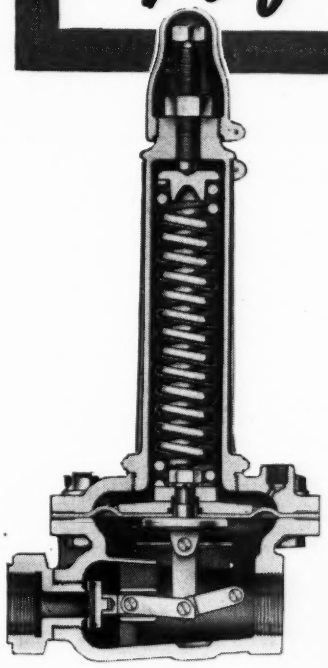
The effect of variables, such as water temperature, water hardness, rate of water flow, and length and location of the anode rod, was studied in the laboratory. Field tests were then carried out in various localities to determine the effect of water composition on the degree of protection afforded by the magnesium rod.

Current work is concerned with the use of organic type tank coatings (protective finishes) in combination with a magnesium anode. It was concluded from the above work that, for galvanized tanks, a single

Three employees of Philadelphia Gas Works Co., shown here with President Hudson W. Reed, recently received gold watches in recognition of exceptional performances while on duty. They are, from left, Raymond J. Szymczak, Howard G. White, Mr. Reed, and Alexander Przybylowicz.

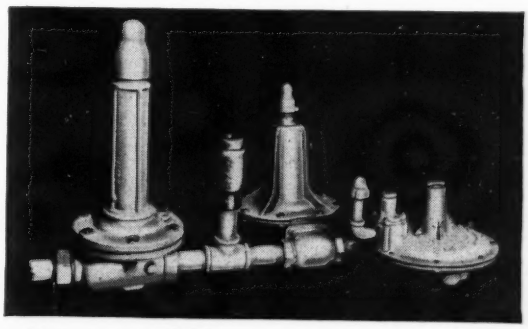
Mr. White, a 39-year-old meter reader, found a defective appliance, vacated the occupants of the house, and avoided a possible accident. The other two men were instrumental in preventing damage and service interruption when a steam line in a gas manufacturing plant broke.

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN Reynolds...

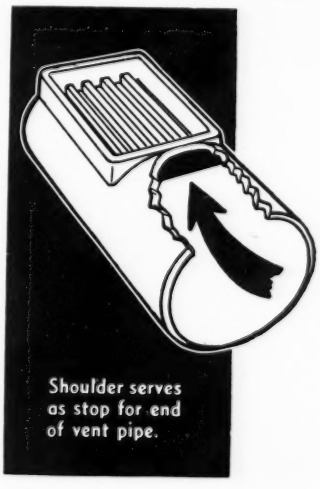


Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892



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- 1/16" slots bar insects yet allow rapid venting. Open area is 50% greater than cross-section area of ⅜" pipe.
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helps you sell her ... and keeps her sold ...

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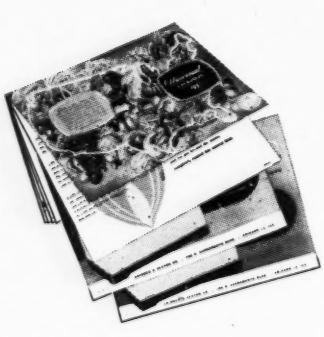
Another is the tremendous *customer satisfaction* that springs from Universal's famous quality of performance and construction. It's the only kind of satisfaction that keeps customers sold ... on the product and the dealer who sells it.

These are just two of the many reasons why Universal will pay off for you, as it has for others, in both *good profits* and *good will*.



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GAS RANGES *for '51*

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anode rod would afford a high degree of protection in approximately 90% of the waters encountered in the continental United States. Refractory waters, characterized by extreme softness, a very low mineral content, and poor conductivity, require two or more anodes to get complete protection. In highly mineralized water a current limiting resistor is used to bring anode current output into line with protective requirements. Black iron or bare steel tanks are also effectively protected but the practical range of application is somewhat narrower (in terms of water compositions) owing to the higher current requirements.

CRITERIA FOR THE CATHODIC PROTECTION OF STEEL IN SOILS—by W. J. Schwerdtfeger and O. N. McDorman.

The cathodic protection of steel in five corrosive soils was investigated in the laboratory, using a specially designed differential-aeration cell. The most significant criterion for cathodic protection was found to be the maintenance of a critical potential on the surface of a test electrode by controlling the applied current. This potential was taken as the point of intersection of the airfree potential-pH curve for steel in soils and the potential-pH curve for the hydrogen electrode at atmospheric pressure. This is approximately —0.77 volt referred to the saturated calomel electrode or —0.85 volts to copper-copper sulfate electrode.

Electrodes maintained for 60 days at this potential lost negligible weight under conditions which produced severe corrosion of unprotected electrodes. The current required to maintain the protective potential diminished to fairly stable values after about three weeks in four of the five soils. This limiting value of current is considered to represent the current which will just maintain the potential of steel at the protective potential.

Values of the stable minimum current required for cathodic protection were in good agreement with the average currents associated with the normal rates of corrosion of the unprotected electrodes. A characteristic discontinuity in cathodic polarization curves for steel in soils is interpreted as an approximate measure of the minimum current initially required for cathodic protection.

Although the electrode potential indicated by this current may be considerably less than the protective potential, it was found that electrode potentials generally drifted to the protective value before appreciable corrosion could occur. Cathodic polarization curves obtained on protected electrodes at the conclusion of the test were characteristic of curves for insoluble electrodes, thereby indicating that cathodic protection had been achieved.

A FIELD INVESTIGATION OF CATHODIC PROTECTION IN GLASS-LINED AND GALVANIZED WATER HEATERS —by W. A. Deringer and F. W. Nelson.

Research started more than 20 years ago demonstrated that the effectiveness of cathodic protection was greatly enhanced when coupled with a glass-fused-to-steel coating. Subsequent research and field experience with glass-lined domestic water heaters indicated that this principle could, perhaps, be

THE NORMAC
BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME. SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

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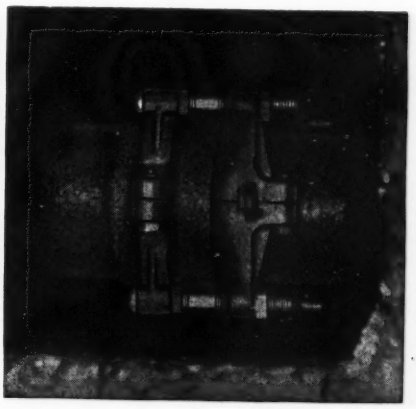
6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

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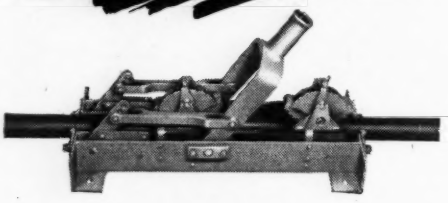

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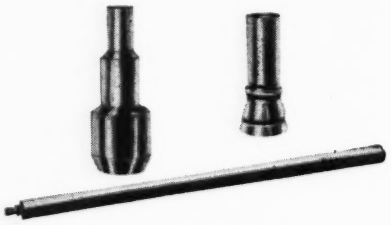
You get double action and continuous operation with a Trojan Model B Pipe Puller and Pusher. It's more than twice as fast . . . doesn't require any resetting of the grip . . . and pushes or pulls up to 2" pipe without additional dogs, clamps, or wedges.
The Model B has three pushing speeds for different types of soil and can be reversed in 30 seconds. It is constructed entirely of steel and weighs 140 lbs. Each part is heavy enough to withstand the most severe treatment.

Heavy steel push pipe comes in 30 inch lengths . . . has all inside couplings, insures straighter travel, and requires a trench only 5½ feet long to operate the pusher. Joints are faced on ends to assure perfect alignment when screwed together.
Pilots and couplings are made large enough to pull covered iron pipe without destroying the covering.



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PERMANENT PIPE REPAIR!

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GAS PURIFIERS

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applied to advantage in this product.

The glass-lining itself being an inert, nonconductive coating would impose no current drain on any cathodic protection device which might be used. Heretofore the glass-lining was the sole protector of a water heater tank against corrosion, and there was always the possibility that the coating might not be perfect. It was thought that a magnesium anode might serve to protect any steel areas exposed.

To evaluate cathodic protection in glass-lined water heaters a field test program consisting of the installation of four glass-lined and two galvanized water heaters in each of 12 very carefully selected cities throughout the eastern half of the United States was carried out. The construction of the tanks used in these test heaters and the method of installing the magnesium anode are described. The program included determination of current flow, anode life, the effect of cathodic protection on the coating itself. After installation, these heaters were inspected at regular intervals both visually and electrically.

After a period of one year, half of the heaters were removed and dissected. The results of this field test program showed how magnesium anodes behave both in galvanized and glass-lined water heaters under a variety of water and performance conditions. Anode life under these conditions was determined and anode life expectancy graphs are shown. Photographs of many of the dissected water heaters are also shown.

POTENTIAL MEASUREMENTS FOR ESTIMATING PROTECTIVE CURRENT REQUIREMENTS—by Scott P. Ewing.

The need for better methods of determining the minimum current required to cathodically protect a buried or submerged steel structure is indicated. It is impossible to investigate all criteria at once so only the open circuit potential was chosen.

The procedure consists of exposing a series of carefully cleaned and weighed pipe samples in a uniform environment and maintaining each of the samples at a definite open circuit potential by adjustment of the applied current. Four sets of samples were exposed in four locations for a period of about 70 days. The ampere hours supplied to each sample were measured with mercury coulometers for the first few days while the circuits were not stable. Later ammeter readings at intervals gave sufficiently accurate results. Because of difficulty in maintaining the potentials at the chosen values, and because of the large cleaning errors on mill scale covered pipe, the results are not as precise as might be desired but certain limits of potential can be chosen where the samples did or did not corrode. These values are all somewhat less than —.85 volt with respect to the copper-copper sulfate.

The potential seems to be a better criterion for protection than current, because the results show that in some soils coatings are formed which greatly reduce the current required to maintain a definite potential. The results also indicate that the potential required for protection varies with the environment. The method appears to be sound in principle and improvements could probably be made which will increase the precision of the results.

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SATISFY MORE CUSTOMERS ... MAKE MORE PROFITS

No fuel can be better than the range that uses it. Service costs steal profits. That's why smart dealers sell Caloric—the dependable trouble-free gas range that assures more satisfied customers, fewer service calls . . . more profits.

Compare Caloric with *any* range at any price for fine construction and simple care-free operation. Examine features that make Caloric America's Easiest Ranges to Keep Clean. You'll agree that high value is what makes Caloric your customers' preference—and your profit line.

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GET BIGGER PROFITS FROM THIS EXTRA CAPACITY CALORIC

2 large ovens, 2 broilers, make this model ideal for large families, or for homemakers who do a lot of roasting and baking.

Guaranteed by Good Housekeeping

Ultramatic **Caloric** Gas Ranges®

America's Easiest Ranges to Keep Clean

Peerless

SINCE 1884 . . .
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THE NATION'S
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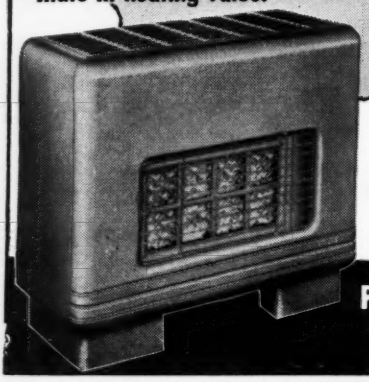
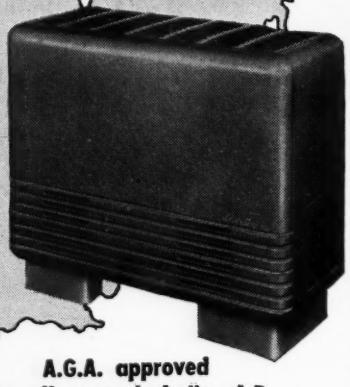
The Peerless line of circulators is pre-eminently the Nation's first choice. For you, that means, greater volume . . . more profits . . . and better satisfied customers. Peerless' modern styling and eye appealing beauty combined with top quality and latest engineering advancements represent the ultimate in heating value.





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Manufactured by one of the country's oldest and most honored Stove Builders. Backed by national advertising in all these magazines.

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PEOPLE

Appointment of R. V. BURNETTE as service manager for Rockwell Manufacturing Co.'s meter and valve division, Pittsburgh, was announced late in April. He will establish repair procedures in the firm's factories and district warehouses. F. C. Arens, Rockwell's Boston district manager, has announced the appointment of J. M. TILLMAN as sales engineer in Rhode Island and Connecticut.

R. V. Burnette
. . . *Rockwell*

R. E. Whitmyer
. . . *General Elec.*

RUSSELL E. WHITMYER has succeeded PAUL E. MILLS as comptroller of General Electric Co.'s air conditioning department in Bloomfield, N.J. Mr. Whitmyer joined the company in 1936. Mr. Mills has been transferred to the firm's main office in New York.

San Diego (Calif.) Gas & Electric Co. has announced the appointment of WILLIAM F. GARBER as engineer in charge of the land division of the engineering department, succeeding the late ROGER S. RUFFIN. Mr. Garber has been in the engineering department since 1923, most recently as supervisor of the land division.

CARL BLOM, chief engineer of Byron-Jackson Co., Los Angeles, since 1940, has been elected a vice president of the company. Mr. Blom has directed many important projects for the firm, including design and manufacture of pumps used at the Colorado river aqueduct, Grand Coulee dam, and on a number of oil lines in foreign countries.

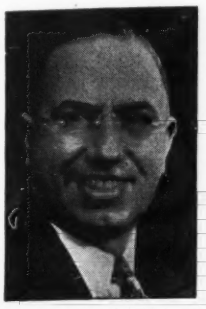
Pittsburgh & West Virginia Gas Co., Grafton, W. Va., has named FRED W. FEST superintendent of production and transportation. He will supervise the Clarksburg and Weston divisions, headquartering in the latter city.

Paul E. Peacock

PAUL E. PEACOCK JR., LP-Gas specialist since 1930, has established an engineering, contracting, and consulting business in Westfield, N.J. Since late 1945 he had been a partner in H. Emerson Thomas & Associates, Westfield consulting firm. Mr. Peacock has engineered and installed more than 50 butane-air and propane-air gas plants, as well as distribution systems, and has been employed as a consultant on special problems in this country and in Sweden.

East Ohio Gas Co., Cleveland, has elected WILLIAM G. ROGERS as president and J. FRENCH ROBINSON, former president, chairman of the board. Mr. Rogers had been executive vice president since last year. In addition, three changes in managerial posts were

William G. Rogers

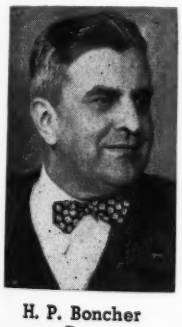


J. French Robinson

announced. GEORGE P. BINDER was named chief engineer. He was succeeded as superintendent of the Cleveland operating division by THOMAS J. NOONAN, general sales manager. The post vacated by Mr. Noonan has been taken over by LEE CORN, former supervisor of domestic sales. Last month Mr. Robinson was also elected president of Consolidated Natural Gas Co., East Ohio's parent. He succeeded F. H. LERCH JR. who became chairman of the board. JAMES COMERFORD, treasurer, was elected executive vice president and HERBERT C. JOHNSON, assistant treasurer, was named treasurer.

New general auditor for Equitable Gas Co., Pittsburgh & West Virginia Gas Co., and Philadelphia Oil Co. is JOHN S. GRAVES. He will headquarter at Equitable's office in Pittsburgh. WALTER C. BOMHOFF has been appointed manager of planning and development for the same three companies and for Bellewood & Monongahela City Natural Gas.

HECTOR P. BONCHER, general manager, Dresser Manufacturing Division, Bradford, Pa., was elected vice president of Dresser Industries at a recent board meeting. Mr. Boncher joined Dresser after he was graduated from college and served as assistant sales manager, sales manager, and general manager.



H. P. Boncher
... Dresser

Stuart M. Crocker
... Columbia Gas

At the company's annual organization meeting, GEORGE S. YOUNG was elected president of Columbia Gas System Inc. and STUART M. CROCKER, former president, was named chairman of the board. He will continue as chief executive officer. Mr. Young joined the system in 1930 as a junior engineer. He has been executive vice president since late 1949.

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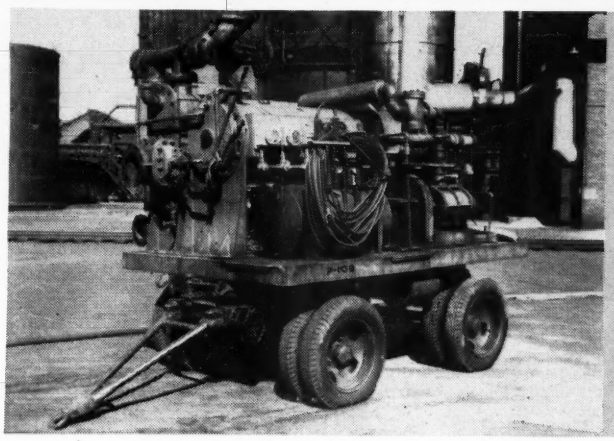
FIRES NOW!



A portable R-C Inert Gas Generator used for purging operations and stand-by protection in large gas-producing plant. Capacity 15,000 cfh.

Today's urgent production demands can tolerate no unwarranted risk of interruption by explosions which might cause even small fires or other plant damage. Against such hazards, R-C Inert Gas Generators provide positive, economical protection.

This protection is essential in plants where inflammable gases, liquids, explosive dusts and other dangerous materials are handled, processed or stored. Available either in stationary or mobile units, R-C Inert Gas Generators greatly reduce the risks from fires caused by explosions. They are compact, simple and sturdy in construction and operate at extremely low cost. Available in capacities from 1,000 to 35,000 cfh.

If your operations involve materials or processes which might cause explosion-produced fires, investigate the protection afforded by R-C Inert Gas Generators. Installation costs in many cases can be offset by insurance savings. Ask us for details.

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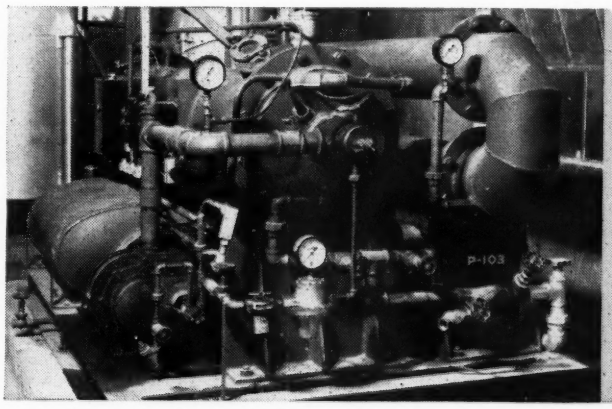
510 Oregon Avenue, Connersville, Indiana



Installation of three R-C Inert Gas Generators similar to this one helped one large plant save $6,000 per month insurance premiums, as well as substantially reduce danger of production losses caused by explosion or fires. Capacity of each unit, 6,000 cfh.

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BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

LOWEST COST PIPE INSTALLATION...

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Please send, without obligation to me, the HYDRAUGER BOOKLET which shows relative costs and speeds of BORING as well as specifications of various Hydrauger models.

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AVOIDS EXCESSIVE TRENCHING

Hydrauger bored holes for pipe installation invariably reduce costs 80% to 90% by eliminating trenching and back-filling to say nothing of man-hour labor savings and safety to highway traffic.

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NO Failures—

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Gas regulators have only one reason for being. They are intended to maintain constant outlet pressures irrespective of varying inlet conditions. BECAUSE of its unique construction features and its "straight-thru" flow principle, Maxitrol is the ONLY regulator which will provide positive outlet pressures over an unusually severe range of inlet pressures. THIS feature is doubly important in the face of varying pressure conditions bound to occur with the rapidly expanding use of natural gas!

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Consolidated Edison Co. of New York Inc. has announced the retirement of two long-time employees, ROBERT E. GROVE, vice president, and L. J. GORMAN, engineer in charge of electrolysis studies and corrosion control. In 1936 Mr. Grove became Con Ed's vice president in charge of rates, legal matters, commercial buildings and relations, and supervisor of the Edison Savings & Loan Assn. Mr. Gorman joined New York Edison Co., now part of Con Ed, in 1911. He has written a number of papers for scientific and engineering periodicals and recently became affiliated with Robin Beach Engineers Associated, as a consultant in the field of elctrolytic corrosion of underground pipe and cable systems.

At its April board meeting, Central Illinois Light Co., Peoria, elected J. A. LONGLEY, resigning president, as chairman of the board, and T. A. SCHLINK, resigning vice president and comptroller, as president and general manager. R. N. WHITE, secretary, was elected secretary-comptroller and A. W. EGGER, assistant secretary, is now assistant secretary-comptroller. Other newly elected officers include three vice presidents: ROY K. DALLAS, GEORGE W. HATHAWAY and EARLE D. EDWARDS.

At a recent meeting, Rochester (N.Y.) Gas & Electric Corp.'s board of directors elected PAUL J. W. MILLER, former assistant secretary, to the office of secretary, and HAROLD W. NICHOLS, former assistant treasurer, to the office of treasurer. Simultaneously it was announced that HAROLD S. WEATHERBY will assume the duties of superintendent of general accounting, in addition to retaining his title of assistant secretary.

Southern Natural Gas Co., Birmingham, simultaneously announced the election of J. W. YELDELL and JOHN M. STARK as vice presidents. Mr. Yeldell will continue as general superintendent and chief engineer while Mr. Stark will retain his duties as manager of the land department. Both men have been with Southern Natural since it began operations in 1930.

New directors elected at the annual meeting of American Natural Gas Co., New York, were JOHN DERN, partner in the Chicago law firm of Sidley, Austin, Burgess & Smith; HENRY TUTTLE, executive vice president of Michigan Consolidated Gas Co.; and RICHARD SCHADDELEE, former president of United Light & Railway Co.

RUDOLF BECKER, chief engineer of Gesellschaft fuer Linde's Eismaschinen is now associated with the chemical plants division of Blaw-Knox Construction Co., Pittsburgh. He will assist Blaw-Knox in the application of the German firm's techniques to American needs.

A. F. REINKING, former assistant sales manager, has been named manager of the Steam Turbine Sales Division of Worthington Pump & Machinery Corp., Harrison, N. J. He will make his headquarters at Worthington's Wellsville, N.Y., plant.

Bowser Inc.'s Incinerator Division, Cairo, Ill., recently announced the election of J. G. DIERKES, former general manager, as president of the division, and WILLIS D. LAFOON as secretary-treasurer.

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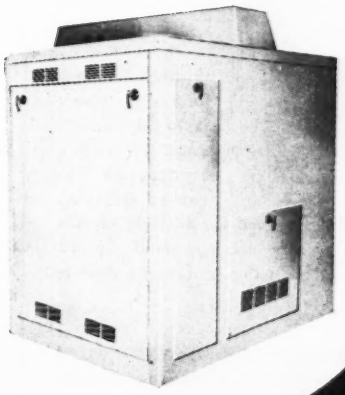

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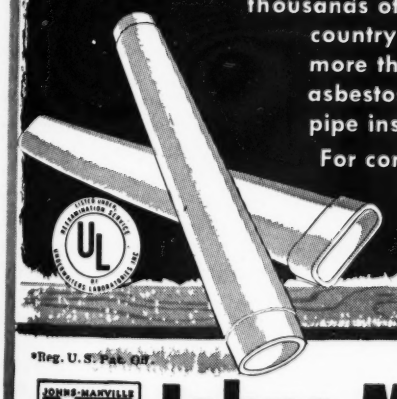

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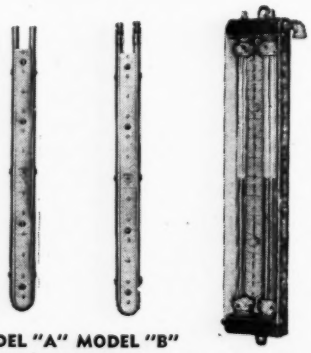

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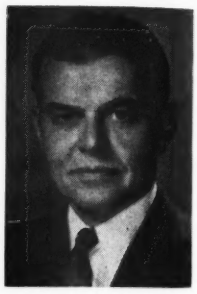

Morse G. Dial

Dr. G. O. Curme

Union Carbide & Carbon Corp., New York, has elected MORSE G. DIAL, director, vice-president, and treasurer of the firm since 1949, as executive vice president. DR. GEORGE O. CURME JR. has been named vice president in charge of research. Since 1948 Dr. Curme has been vice president in charge of chemical research.

A number of appointments were announced last month by Laclede Gas Co., St. Louis. C. E. SCHOENE, chief engineer, became consulting engineer, a new position. O. R. ALLGEIER was advanced to chief engineer, and H. M. GERKEN, superintendent of the service and installation department, was named assistant to Mr. Schoene. WILLIAM M. HAWKINS has succeeded Mr. Gerken. ALLEN H. BURGESS, formerly with Oklahoma Natural Gas Co., was named general superintendent. HARRISON LIEBRUM will assist Mr. Hawkins. E. F. TRUNK was promoted to development engineer, ROBERT E. MURRAY to load control engineer, and WILLIAM H. DONNELLY to assistant to Mr. Murray.

Several promotions have been announced by Southern California Gas Co., Los Angeles. R. I. SNYDER, manager of purchases and stores, was named assistant manager of distribution, and S. A. BRADFIELD became assistant manager of transmission. J. L. OBERSEIDER is now gas transmission engineer and other appointments include H. A. ROGERS as Alhambra district manager, J. M. BURKE as El Centro district agent, L. E. WATKINS as eastern division sales supervisor, and A. G. CREWS as Kern division sales supervisor.

Borg-Warner Corp., Detroit, has announced the appointment of two regional managers in the Norge Heat division— FRED POTTER and RALPH E. RAWLES. Mr. Potter will cover the territory of Kansas, Missouri, southern Illinois, Oklahoma, Texas, Arkansas, Louisiana and Mississippi, while Mr. Rawles will work in Virginia, Kentucky, Tennessee, Alabama, Georgia, Florida, and North and South Carolina.

Philadelphia Electric Co. has announced that M. F. GAVETTI JR. has succeeded A. H. WORTHINGTON as gas superintendent of the company's Schuylkill division. Mr. Gavetti has been with the firm since 1937, most recently as assistant plant superintendent.

COLIN C. SIMPSON, assistant vice president of Consolidated Edison Co. of New York Inc., and an authority on gas distribution systems, retired March 1 after more than 40 years in the public utility field. He was 65.

A number of personnel changes have been announced by Arkansas Natural Gas Corp., Shreveport, including appointment of E. R. BONDURANT as assistant sales promotion supervisor of the Texarkana district; JACK R. ELLIOTT, sales supervisor of the same district; R. W. LEDEEN, sales supervisor of the Louisiana-Texas district; L. T. SHELTON, assistant sales promotion supervisor of the southern division; and LEWIS WATKINS, sales representative for the Mt. Pleasant district.

Southern Counties Gas Co., Los Angeles, recently announced the appointment of JAMES D. MACFARLAND as assistant to the vice president. Formerly with the personnel department, Mr. MacFarland will assist in the development of programs and policies previously under the jurisdiction of Vice President Frank B. Wright. Effective May 1, JOHN D. DAY was appointed assistant secretary of the company.

ARTHUR E. WASTIE, former manager of the eastern office of Phillips Petroleum Co. and Pacific Gas Corp., has been elected vice president and chief engineer of H. Emerson Thomas & Associates Inc., Westfield, N. J. He replaces PAUL E. PEACOCK JR., who resigned to engage in private LP-Gas engineering.

De Laval Steam Turbine Co., Trenton, N.J., has appointed T. A. NIELSON as district manager of the firm's recently opened district office in Houston, Texas. At the same time, it was announced that A. N. SANRICH, southwest technical representative in Oklahoma and Texas, will also headquarter in Houston.

Fluor Corp. Ltd., Los Angeles, has promoted ROBERT L. MERRICK, manager of engineering, to manager of engineering and construction. JOHN MARSHALL took over Mr. Merrick's former position, and FRANK G. CRAWFORD became chief mechanical engineer.

Estate Stove Co., Hamilton, Ohio, has appointed WILL HEMSWORTH Chicago division manager . . . Long Island Lighting Co., Mineola, N.Y., has elected CHARLES E. ELBERT to succeed EDWARD J. CRUMMEY as secretary and FRANCES J. THUMSER, chief law clerk, to succeed Mr. Crummey as assistant secretary... Coroaire Heater Corp., Cleveland, Ohio, has appointed JOHN E. BOGAN as western divisional manager . . . B. V. RONCO has been appointed chief engineer of Morrison Steel Products Inc., Buffalo, N.Y.

Last month D. A. HULCY, president, Lone Star Gas Co., Dallas, was elected president of the Chamber of Commerce of the U.S. Mr. Hulcy has been on the organization's board of directors since 1946 and was a vice president last year . . . REUBEN B. HAYS, president of the First National Bank of Cincinnati, has been elected a director of Cincinnati Gas & Electric Co.

GRANT OVERCASH has been appointed sales representative for the Dallas, Houston, and San Antonio areas for Temco Inc., Nashville, Tenn. . . . Florence Stove Co., Gardner, Mass., recently announced the appointment of JAMES J. MANNING to the new position of manager of sales, range division. THOMAS P. NUGENT succeeds Mr. Manning as New England division manager . . .

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WANTED: POSITION AS MANAGER OR SALES manager with progressive natural gas utility. 20 years experience in all phases. Excellent references. Middle West location preferred. Box 55, GAS, 198 So. Alvarado St., Los Angeles, Calif.

SERVICES AVAILABLE, DISTRIBUTION AND Service Dept. Superintendent. 25 years experience with water, coal and oil gas. 43 years old. Family man with good habits. Well recommended. Box 60, GAS, 198 So. Alvarado, Los Angeles, Calif.

WANTED: ASSISTANT CHIEF GAS ENGINEER. Established and expanding gas and electric utility company located in Wisconsin needs an experienced gas engineer to be functionally responsible for maintaining and developing the company's gas and water utility facilities. This permanent position is available to a graduate engineer with approximately 10 years of varied experience in gas utility work. Please write, giving full particulars of personal background, education, experience and present salary level. All replies treated with strictest confidence. Address applications to Wisconsin Power and Light Company, 122 West Washington Ave., Madison 1, Wisconsin.

NATURAL GAS COMPANY LOCATED IN NORTHwest has opening for recent graduate in natural gas or petroleum engineering for general engineering work in gas utility. Prefer individual with two or three years experience but will consider recent graduate. Replies confidential. Montana-Dakota Utilities Co., Second Ave. South at Ninth St., Minneapolis 2, Minn.

NATURAL GAS PIPE LINE COMPANY LOCATED in northwest has opening for gas measurement engineer or accountant, age under forty, for general supervision of gas measurement and accounting for pipe line system. Replies confidential. Montana-Dakota Utilities Co., Second Ave. South at Ninth St., Minneapolis 2, Minn.

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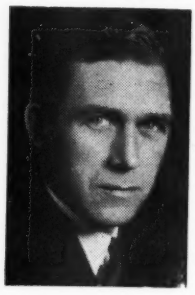


C. B. Dushane

J. F. Donnelly
. . . A. O. Smith

Election of JOHN C. DIEHL as chairman of the board and W. G. HAMILTON JR. as president has been announced by American Meter Co., New York. Mr. Diehl has been president since last August, and Mr. Hamilton was previously vice president in charge of sales. W. B. ASHBY, assistant to Mr. Hamilton, has been elected secretary, and C. B. DUSHANE, manager of the Midwest sales division in Chicago, is now vice president in charge of sales and will be located in Philadelphia. Other recent promotions include A. F. BENSON to vice president of engineering, A. E. WEINGARD to vice president of production, and E. W. WILEY to vice president of research, all in Erie, Pa.; A. MCW. WOLFE to vice president in Boston; and P. C. STRUBLE to vice president of purchasing.

Milwaukee (Wis.) Gas Light Co., recently announced the appointment of JOHN J. DOLAN, former first assistant city attorney of Milwaukee, as vice president in charge of personnel. Mr. Dolan, a member of the city attorney's office for 15 years, handled the legal work involving the introduction of natural gas to Milwaukee.

J. F. DONNELLY has been named assistant manager of A. O. Smith Corp.'s water heater division, Kankakee, Ill. F. S. Cornell is manager of the division but its operation will be Mr. Donnelly's responsibility. S. E. WOLKENHEIM succeeds Mr. Donnelly as marketing director of the division.

Obituaries

FRANKLIN F. SCHAUER, former president of Equitable Gas Co. and Pittsburgh & West Virginia Gas Co., died recently in St. Petersburg, Fla. where he had lived since his retirement in 1945. Mr. Schauer joined Equitable Gas, Pittsburgh, in 1920 as assistant to the general manager and later became general manager. In 1925 he became president and general manager of Equitable and Pittsburgh & West Virginia, and in 1942 was elected president of the two companies, serving in that capacity until his retirement three years later because of ill health. Mr. Schauer was an active member of the American Gas Assn. and past president of the Pennsylvania Natural Gas Men's Assn.

Lone Star Gas Co., Dallas, announced the recent death of EARL WILSON YORK, 48, foreman of its central meter shop at Garland, Texas. Mr. York joined the company in 1924 as a traveling meter repairman, and later served as foreman of the meter shop at Handley, Texas.

DONALD D. BEACH, industrial sales manager, Atlanta (Ga.) Gas Light Co., died on April 29 at the age of 48. He had been associated with the company since 1930 and, prior to that, was district engineer for Ohio Fuel Gas Co., Columbus.

On May 3 FRANKLIN T. RAINEY, vice president of East Tennessee Natural Gas Co., Knoxville, died in Toledo, Ohio. He was 57 years old. He was general chairman of the AGA industrial gas committee.

BENJAMIN S. LONG, assistant secretary of Consumers Gas Co., Toronto, died April 19 at the age of 67. Mr. Long had been associated with Consumers for 40 years.

EARLE FRANCIS POTTER, president and general manager of the Missouri Natural Gas Co., Farmington, Mo. since 1936, died recently at the age of 70.

HENRY ZEIGLER, 52, vice president of the Wilcolator Co., Elizabeth, N.J., died recently in Nashville, Tenn. He had been connected with the company for 26 years.

REINHOLD O. SIEGMUND, 73, retired chief draftsman of Peoples Gas Light & Coke Co., Chicago, died April 13 in Elmhurst, Ill.

KEYSTONE'S MICROWAVE

By E. B. DUNN
Keystone Pipe Line Co.

A pioneer in the use of this new communications method, Keystone Pipe Line Co. of Philadelphia has found that its performance has "exceeded both our requirements and our expectations"

Modern transportation and modern communications have been developed simultaneously during the past century. The past 50 years have seen the emergence of the telephone as the instrument chiefly relied upon by pipeline companies and other businesses for dispatching and general business communications.

Despite this, the need still exists for a more reliable communication method for these two purposes. Circuit interruption due to weather, storms, and man-made accidents remains a hazard; and the cost of constructing and maintaining telephone right-of-way bulks large.

As a result, pipeliners have long considered the use of radio for their point-to-point communications circuits. Radio uses a transmission medium which is essentially immune to failure due to acts of God or man—and which is, best of all, provided rent-free by Mother Nature.

Most pipelines already use VHF radio for mobile communications from base stations to trucks, repair crews, etc., and occassionally use these frequencies for emergency communications from one fixed point to another. However, prior to the last war, there was not enough space in the usable radio spectrum to accommodate existing vital radio services, and no space at all to be used for replacing land lines in point-to-point service.

Wartime developments in super-high frequencies for radar, shoran, IFF, etc., changed all this. In a few years, the radio "frontier" was pushed upward from about 150 megacycles to about 30,000 megacycles. These newly available microwave frequencies increased the usable radio spectrum by more than 200 times the entire prewar space.

After the war, the Federal Communications Commission allocated the microwave spectrum to various users. The frequencies between 150 and 950 megacycles were given to television, aircraft, mobile, radio altimeters, citizens band, color television, and government services. The space above 950 mc has been reserved for radar, microwave communications, microwave diathermy, television relaying, aircraft navigation, and experimental purposes.

Mr. Dunn presented this paper at the Southern Gas Assn. convention in Biloxi, April 23-25.

IN November of 1949, Keystone Pipe Line Co. put into commercial operation the first microwave communications system employed for pipeline use. This system employs pulse time modulation equipment manufactured by Federal Telephone & Radio Corp. The system is about 70 miles in length, and uses three terminals and two relay repeaters, all of which operate unattended.

The tremendous radio band width available in the microwave spectrum allows one microwave relay system to carry a large number of communications channels. The Bell microwave systems can handle 1000 telephone conversations, or perhaps two television programs. Since pipelines haven't yet figured out a way to use 1000 circuits, the equipment offered for pipeline use is designed to handle from 5 to 24 channels. Once the basic equipment is installed with a few channels, additional circuits can be added very cheaply up to the design limit of the equipment. The cost is about $700 per channel.

The audio quality of microwave circuits is equal to or better than anything ever offered by wire lines. Audio bandwidth may be whatever you desire, but is generally designed for 200- to 3400-cycle telephone service. Channel noise in our equipment is usually 50 decibels below one milliwatt (flat weighting), and is not apparent unless the channel output is amplified. Transmission losses may be completely eliminated; in fact, the Keystone Pipe Line dispatching circuits operate from end to end over the microwave at a slight gain. Crosstalk is almost non-existent.

Competition in the microwave field has made it possible to install a simple microwave system in flat country for about $600 per mile with eight through channels. A four-channel dispatching system through rough country, with drops every 30 miles, and with spare or standby radio equipment would cost about $1200 per mile of pipeline. For

TABLE 1. Annual Cost of a Microwave System*

Maintenance	
Salary and travel expense of one maintenance man	$ 6,500
Small tubes (annual change)	1,000
Transmitter and power supply tubes (twice yearly)	3,000
Building and tower maintenance, spare parts	1,000
Electric power ($25 per month per location)	2,500
	$14,000
Depreciation	
Radio equipment (10-year life)	$10,000
Buildings and towers (20-year life)	5,000
Taxes	1,000
	$16,000
Total Cost	
Per year	$30,000
Per mile (150-mile system)	$200
Per mile (200-mile system)	$150

*150 miles in rough terrain or 200 miles in flat country.

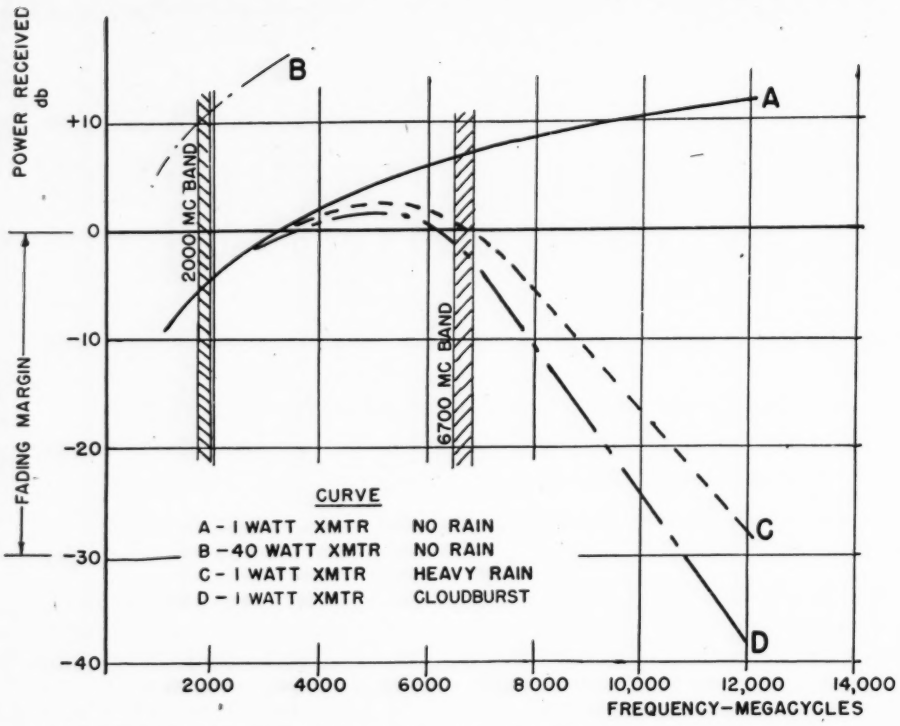


Fig. 1. Effect of weather on microwave circuits. Constant transmitter power and antenna size are assumed.

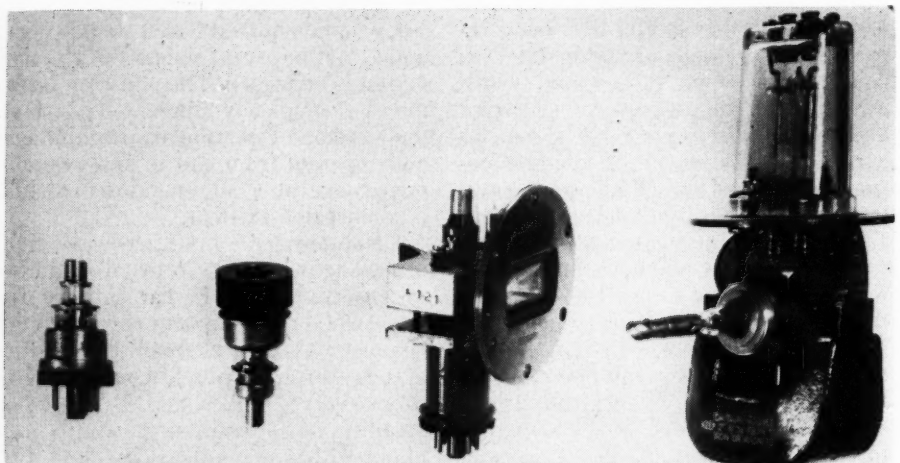


Fig. 2. Tubes used in the system. The two at left, 2C43 and 2C39, respectively, are co-planar triodes, also known as "lighthouse" tubes. Second from right is a Klystron X26D. At right is 2J70, a radar magnetron used in 3200 mc commercial radar.

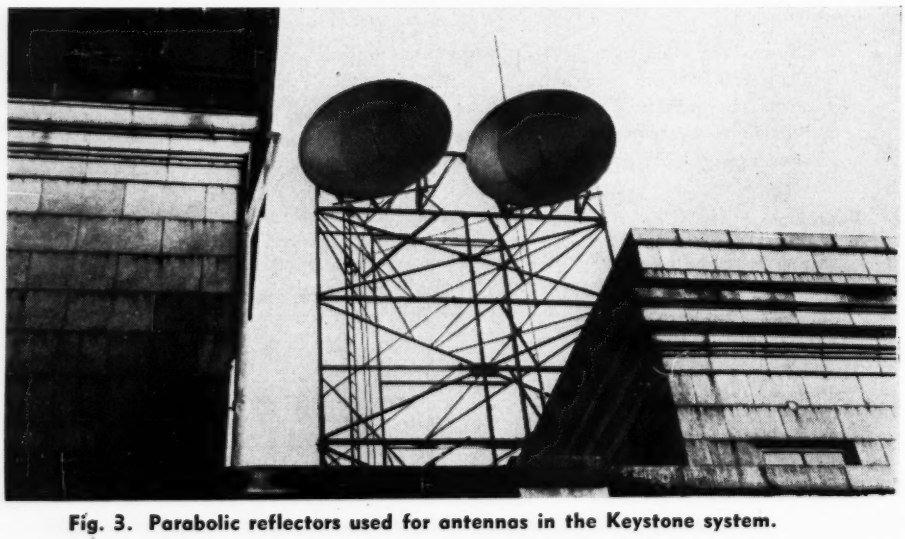


Fig. 3. Parabolic reflectors used for antennas in the Keystone system.

estimating purposes, a good figure to use is $20,000 per microwave link. Microwave costs, like telephone costs, depend largely on the type of service required and the nature of the terrain.

It is difficult to make a single estimate of annual cost which is an average of all pertinent factors in a field so new. However, based on Keystone's experience with the Federal equipment and based on the feeling that 150 miles in Pennsylvania or 200 miles in flat country is the maximum distance which one man can service, these estimates would be as shown in *Table 1*.

Another company operating a products pipeline in the Pennsylvania area reports that its annual cost of leased telephone circuits is about $75 per line mile including circuit rental, equipment rental, and taxes. Considering this a company must have need for either two or three leased circuits before an economic justification of a microwave system can be made. However, this simple economic fact neglects the benefits of the other circuits which are available on microwave at little extra cost. These circuits can be used for pipeline business, for telemetering and remote control, and for the control of mobile radio base stations. In addition, there is a real advantage in microwave reliability and in the fact that a microwave system can be independent of outside maintenance effort.

For those who feel that their needs alone do not justify the investment, the possibility is suggested of forming a joint system operated by two or more parallel pipelines on a cost sharing basis.

Microwave Spectrum

The microwave radio spectrum is a loosely defined band of radio frequencies extending from about 1000 mc (wavelength: 30 centimeters) to about 30,000 mc (wavelength: 1 cm). The curves of *Fig. 1* show some of the characteristics of these frequencies. Since the antennas used increase in effectiveness with increasing frequency, the received signal might ordinarily be expected to increase with increasing frequency, all other factors being held constant. (Curve A). However, normal weather conditions seriously affect the microwave frequencies above 7000 mc (Curves C and D). A 10,000-mc radar can be completely blanked out by a tropical cloudburst; a 30,000-mc radar is limited to a few miles effective range by water vapor absorption. An interesting sidelight is the fact that these highest frequencies are useful in the laboratory for microwave spectroscopy of gases.

From the curves of *Fig. 1* it might be concluded that the microwave spec-

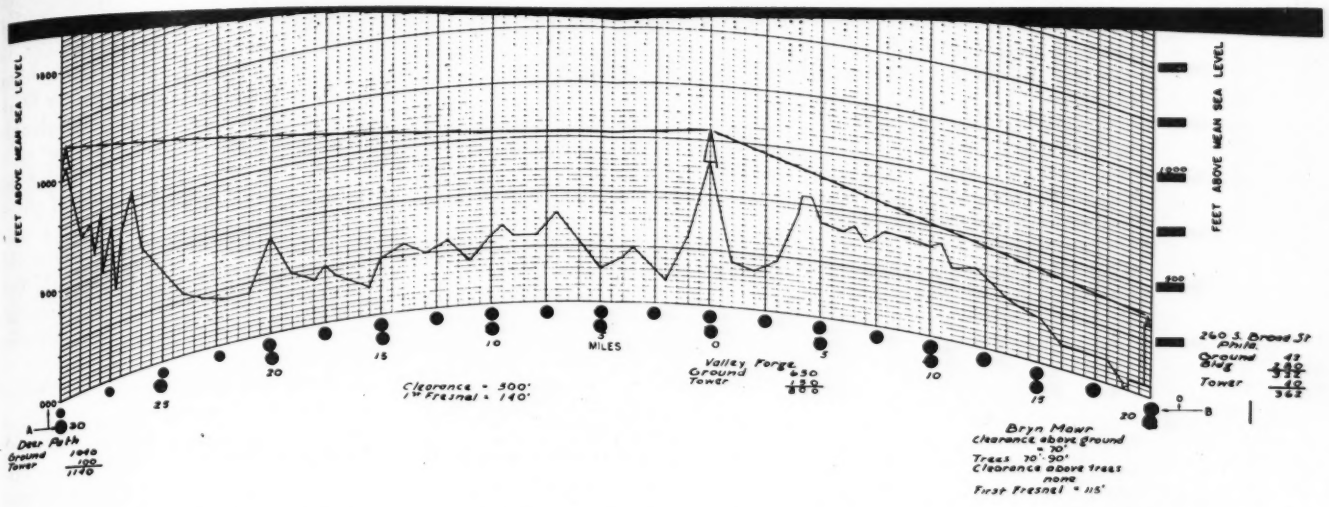


Fig. 4. Profile of two main "hops" of the Keystone system showing the effect of the earth's curvature.

trum in the neighborhood of 5000 mc would be the ideal spot for microwave communications. But this band is, of course, reserved for government use. Pipeline communications fall into two bands, 2000 mc and 6700 mc. The increased antenna efficiency of the higher band is partially offset by the higher power of lower band transmitters. (Curve B).

Tube Development

Of the many factors which have contributed to the successful use of microwave frequencies, perhaps the most important has been the development of tubes which could produce a usable amount of radio power at these high frequencies. The ordinary triode has been pushed higher and higher in operating frequency until it has become anything but ordinary in appearance. Because of their shape, 2C43 and 2C39, the two microwave triodes shown in *Fig. 2* are commonly known as "lighthouse" tubes. They are used in the range of 100 to 3000 mc, and are commonly employed as output tubes in 2000-mc microwave equipment. They are capable of about four to six watts average power output, or of about 40 watts peak power when used in pulse type equipment. Their cost is $25 and $40 each.

The 6700-mc equipment makes use of the velocity modulated oscillator known as a Klystron. The sample Klystron shown in *Fig. 2* is the X-26-C used by Philco. It is rated at one watt average power output, and costs in the neighborhood of $150 to $200.

Radar installations, commonly employ a tube known as a magnetron. The magnetron shown in *Fig. 2* is the 2J70 used by the Raytheon in their 3200-mc commercial radar. It is rated at 15 *kilowatts* peak power, and costs about $180. Other magnetrons exist which are capable of producing as much as 2 million watts peak power. The tremendous power output of these tubes will mean that they may hold the key to the use of the higher microwave frequencies for communications once the technical problems involved in their modulation, cost, and life are solved.

The second technical factor which has been responsible for the success of microwave communications is the use of parabolic reflectors for antennas. Those shown in *Fig. 3* are used in the Keystone system and are mounted on the roof of the Philadelphia office building. Reflectors form the microwave energy into a radio beam in the same manner that a flashlight forms light into a beam. This beam concentrates the radio energy 1000 times until the 40-watt output of the transmitter becomes, in effect, 40 kw. Thus, a tiny tube can provide enough power to overcome space loss, and at the same time, provide a large safety margin which is held in reserve to combat atmospheric fading and equipment deterioration. Furthermore, the use of narrow beams prevents interference with other beams in the same area. Developments made since the KPL system was installed allow one antenna to be used for both transmitting and receiving.

As previously indicated, microwaves in many ways resemble light waves more than they resemble ordinary radio. They may be reflected and refracted; and, although they do penetrate fog, rain, and snow with almost no loss, they will not pass through objects such as buildings, hills, or trees. They travel in a straight line, and there is little bending around the earth, and no reflection from the ionospheric layers in the upper atmosphere.

For all these reasons, microwave communications are limited to paths over which there is a clear, unobstructed line of sight—from hilltop to hilltop, from tower to tower. The average distance per microwave hop is about 25 miles.

Fig. 4 shows a profile of the two main hops of the Keystone Pipe Line system which has been plotted from USGS maps and laid out to show the effect of the earth's curvature. The first hop out of Philadelphia barely has grazing clearance about the trees in midpath, but the second hop has nearly 500 ft clearance (a situation which delights the microwave engineer.)

Self-Supporting Tower

To obtain a line of sight on the first path, it was necessary for Keystone to erect a 150-ft tower at the Valley Forge relay point *(Fig. 5)*. This is a self-supporting tower with the antenna dishes at its top. The radio equipment is housed in the building at the base along with the emergency power supply and tower lighting controls (see *Fig. 6*). The antennas are fed through co-axial line. This arrangement avoids the dangers, personnel problems, and extra tower cost of having the equipment building at the top of the towers. However, the coaxial line represents a substantial cost (about $5 a foot, installed), and the loss in a 150-ft run will sacrifice half of the transmitter power (3 db). Since both of these factors increase with frequency, the 6700-mc equipment employs a system of having the antennas mounted horizontally at ground level with a passive mirror reflector at the top of the tower. (See *Fig. 7*—Humble pipeline, Philco installation). This scheme is useful in the range of about 70 to 300 ft in tower height. Below 70 ft, transmission lines are cheaper; above 300 ft, the passive reflectors are too large.

It is interesting to note that large, ground-mounted passive reflectors may

Four Types of Towers in Use

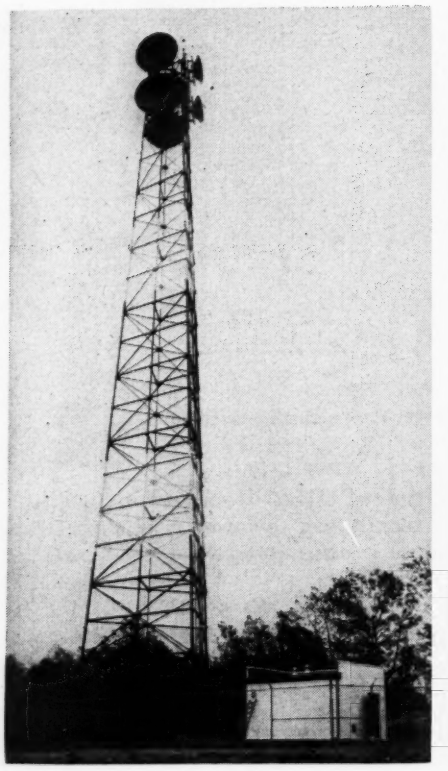


Fig. 5. One hundred fifty-foot tower installed at relay station at Valley Forge. For view of building at base of tower housing radio equipment, see Fig. 6 on page 86.

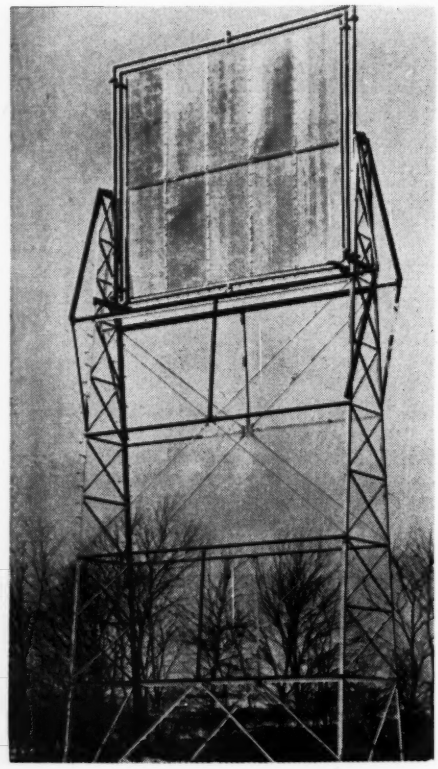


Fig. 8. Large passive reflector used on Westinghouse installation for Pennsylvania Electric Co. bends microwave beam.

Fig. 7. Guyed microwave tower with passive reflectors at top as installed on Humble pipeline.

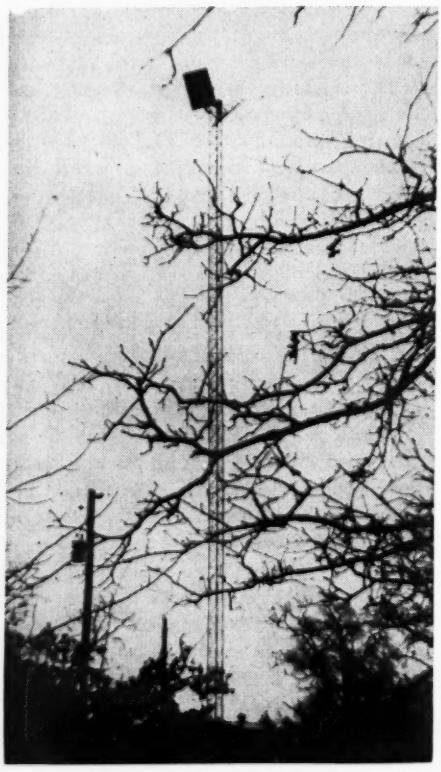
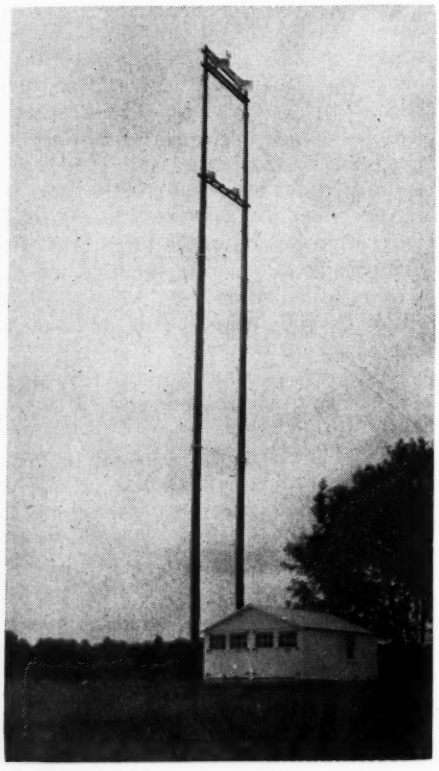


Fig. 9. Multiple guyed 110-ft H-frame installed by Raytheon on experimental New York - to - Boston line.



be used to "bounce" the beam aroun corners to avoid obstructions such as nearby hills or buildings. *Fig. 8* shows such a passive reflector used on a Westinghouse installation for Pennsylvania Electric Co.

There is some controversy regarding the merits of self-supporting and guyed towers. Guyed towers do require more land for the tower site, but become increasingly more economic with increasing height. The "break-even" point falls somewhere around 75 ft depending on land cost.

A form of tower construction which may become increasingly popular as steel becomes scarce is the "H-frame" structure made of wooden poles. *Fig. 9* shows a 110-ft, multiple guyed, H-frame installed by Raytheon on its experimental link from New York to Boston.

Service on the Keystone microwave system is completely unaffected by storm, ice, rain, fog, snow, static, or magnetic storm. When the east coast "hurricane" hit us in late November of 1950, the microwave system alone rode through the storm without trouble. Our wire lines have been out of service for a week or two at a time following a Pennsylvania ice storm, but the microwave has gone through ice storms without faltering.

Atmospheric Fading

The one weather effect which prevents perfection is the phenomenon known as atmospheric fading, experienced during the summer and early autumn months. This fading is a result of beam bending which, in turn, is caused by "stratification" of the moisture vapor content of the air immediately above the ground. This might be the result of a weather front which moves warm, dry air in over-moist air to produce a gradual fade (*Fig. 10*, Curve A) resulting from down-bending of the beam.

This same phenomenon causes unusually long distance reception of television, FM, mobile radio, and radar, since it often causes the beam to follow the curvature of the earth. The second type of fade (*Fig. 10*, Curve B) is a result of the opposite conditions, dry air under moist air. This usually occurs on a clear, still night following a humid day when the earth's heat is rapidly lost by radiation, and the moisture vapor is absorbed out of the lower atmosphere by the cool earth to form heavy dew or patches of ground fog. The resulting up-bending of the beam cuts off the signal suddenly and completely.

Since the typical radio engineer has very little influence with the weatherman, there is nothing he can do about atmospheric fading. He can build a

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If you have compressor needs from 1500 to 3000 hp coming up, get *all* the facts on GMW's. Weigh the important gains you stand to make. For units of lesser horsepower, the other Cooper-Bessemer V-angles, GMV's and GMX's, will prove to be your best bet.

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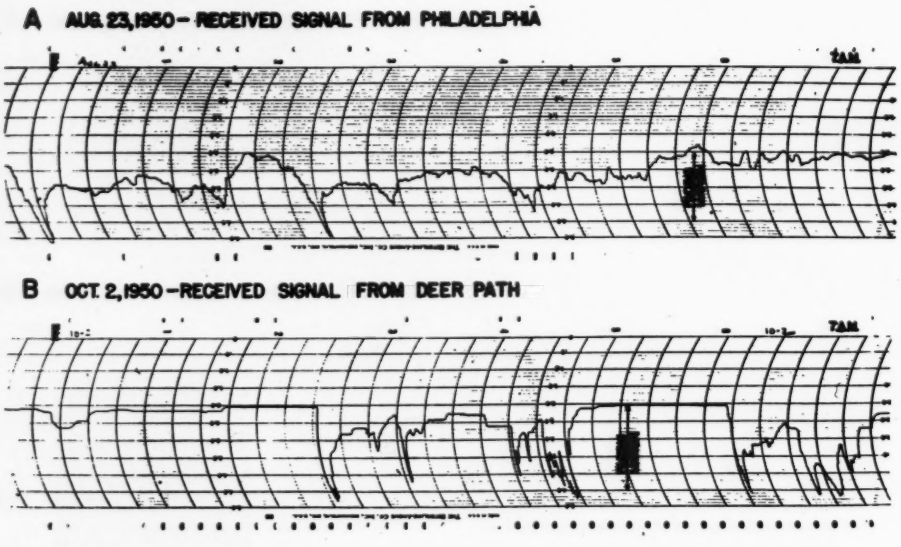


Fig. 10. Atmospheric fading as experienced on Keystone link in summer and fall of 1950. Link was out of service only when fading caused AVC recorder to dip below fading margin.

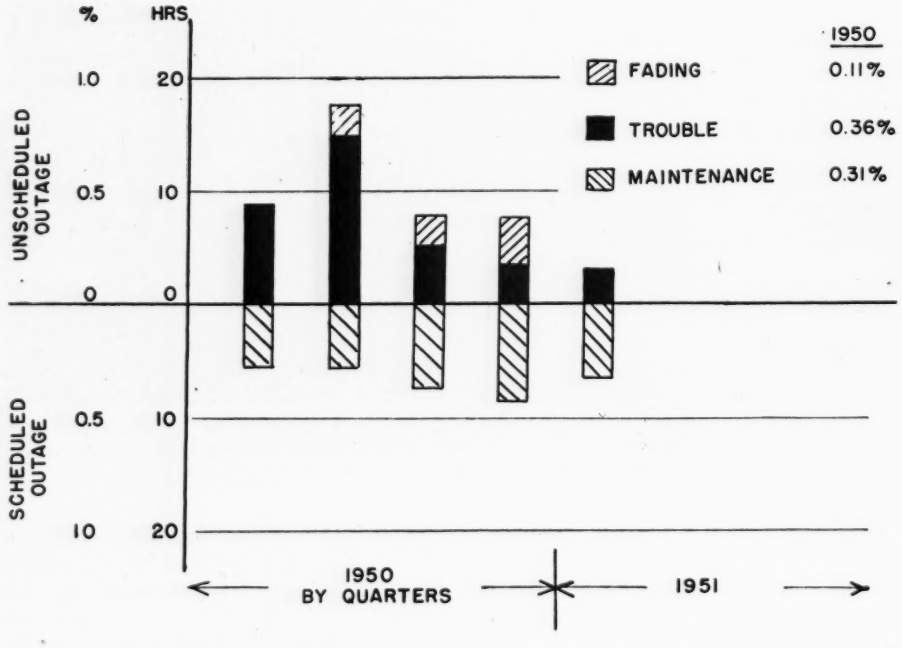


Fig. 11. Chart showing microwave outage time on Keystone system.

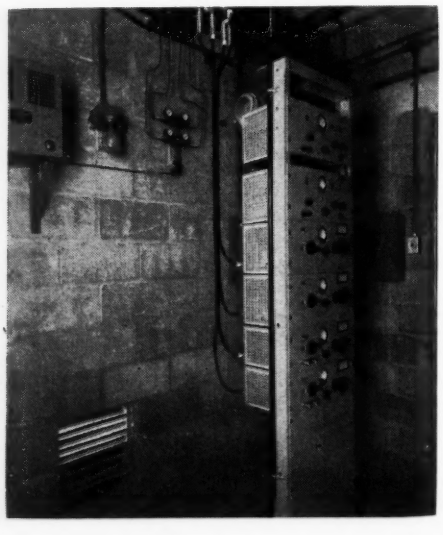


Fig. 6. Radio equipment which, with emergency power supply and tower lighting controls, is housed at the base of the 150-ft tower shown in Fig. 5.

large margin of safety into the equipment, perhaps 30 db, or 1000 times the power normally needed, and this will reduce the fading outage time to something on the order of 0.05% or about five hours per year, per hop according to Keystone experience. Shorter hops and higher towers will help, but these are not usually economic.

The one saving factor is that atmospheric fading usually occurs in the small hours of the night, from 11 p.m. until 4 a.m. This is hard on the maintenance man's sleep, but it is a time when circuits are lightly loaded, and when long distance calls go through with little delay.

All of the factors which affect the performance of the Keystone microwave have been combined in the outage time record shown in *Fig. 11*. The atmospheric fading outage totaled 9.6 hours for the year of 1950, and all trouble outage added up to 31.8 hours for the year. This was largely due to tube failure; over 50% was due to failure of the 2C43 transmitter tubes. The large outage time in the second quarter represents our difficulties with the first 2C43's of post-war manufacture. During this period the average life on these tubes was only two months. However, experience has enabled us to detect failures in advance, and the average life has recently been raised to about five or six months by the simple expedient of raising the filament voltage slightly.

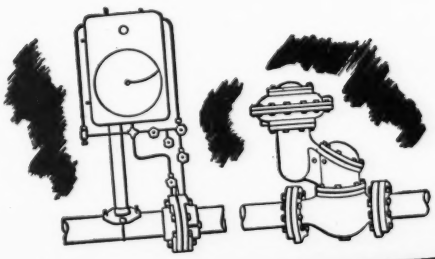
The Keystone system has no spare equipment, and the majority of our trouble outage could have been eliminated by standby RF equipment. Likewise, standby equipment would have prevented the scheduled outage time required for all tube changes and maintenance. In a long microwave system the cumulative effect of maintenance outage would in itself justify standby.

The Federal PTM multiplex equipment has been most reliable. Since December, 1949, Keystone has had no multiplex trouble which caused a loss of all circuits, and only two isolated cases of tube failure in an individual channel.

At present it is Keystone's custom to make a weekly check of each unattended repeater, but this could easily be extended to two-week intervals, and perhaps even to monthly intervals. The equipment is stable in RF frequency and in multiplex operation. Maintenance is greatly facilitated by using the oscilloscope to make visual checks of all circuits. Trouble outage time has been largely the time required to locate the maintenance man and get him to the source of trouble. It has averaged about two to three hours per outage. Speedy fault location would be greatly facilitated by a system of fault tones or fault alarms, and such a system of fault location would become a must on a longer microwave system which did not have standby RF.

In conclusion, I believe I can speak for our management in saying that the Keystone experiment in microwave has been completely successful, and that its performance has exceeded both our requirements and our expectations. The best evidence of this success is the manner in which microwave has been accepted by the natural gas transmission firms to solve their communications problems.

SOME EASTERN SEABOARD REGIONS NOW RECEIVING NATURAL GAS THROUGH AMERICAN METER COMPANY EQUIPMENT



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PIPELINE NEWS

Federal, State Action On Line Safety Looms

Mounting concern over the hazards of high-pressure natural gas pipelines to public safety last month was lending urgency to national and local drives to place the design and construction of such lines under governmental supervision.

H. R. 88, the bill introduced by Representative Heselton of Massachusetts, to give authority to the FPC to prescribe safety regulations, appeared to be gaining support, while in Westchester county, N. Y., and Connecticut, public opinion was pressing for safeguards on a state-wide basis.

In Washington, the commission, which by terms of the bill would "prescribe such requirements, restrictions, and conditions with respect to the construction, operation, and maintenance of facilities for the interstate transmission of natural gas as in its opinion are necessary to the promotion of safety," indicated its willingness to add these duties to its present jurisdiction. The commission declined to undertake responsibility for the enforcement of its rulings, however.

"The manpower (required would be) wholly disproportionate to the benefits which would probably result, and the continued policing of the operations of all natural gas companies would be an insuperable task," the commission was quoted as saying. "Furthermore, if reasonable regulations are promulgated, there is every reason to believe that companies would adhere to them in their own interest."

The commission stated that "the only standard guide now generally available," the 1942 *Code of Pressure Piping*, does not provide adequate standards for modern high-pressure transmission pipelines, "nor is its observance compulsory."

The Commerce Department expressed the opinion that the new authority "appears to be consistent with the regulatory powers exercised by FPC."

Transcontinental Gas Pipe Line Corp. was quoted by Representative Heselton as having "no objection" to the bill. Some executives of pipeline companies expressed preference for federal control to state regulation, which lacks uniformity among the various states which a single line might cross.

In Connecticut, Governor Lodge urged passage of a state bill to make constructors "subject to such rules and regulations as the public utilities commission shall prescribe or adopt pertaining to layout, construction, and operation."

Private citizens there have been fighting for weeks to have the Transco line laid along the parkway, and away from their homes.

FPC Okays Penn Project

Authorization has been granted to Pennsylvania Gas Co., Warren, by the FPC to construct 52 miles of 12¾-in. line to parallel existing lines between Warren and Erie, and to add five new compressor units on its system in Pennsylvania.

The new line will be used to augment winter supplies of natural gas to Corry and Erie, and during the summer to transport gas to the company's storage area. Three units totaling 990 hp will be installed at Roystone compressor station in Warren county, and two units totaling 440 hp will be installed at Sackett station in Elk county, Pa.

Estimated cost of the project is $2.2 million.

MidSouth to Purchase Line

MidSouth Gas Co., Little Rock, has applied to the FPC for authorization to purchase a 38-mile, 12¾-in. natural gas pipeline now being constructed in Arkansas by Arkansas Power & Light Co., Pine Bluff, at a cost of $900,000.

The line will extend from a connection with facilities of Texas Gas Transmission Corp. near Helena, Ark., to Arkansas Power's Hamilton Moses steam electric generating station near Palestine, Ark. MidSouth plans to transport gas for Arkansas Power under a transportation agreement between the two companies. The commission previously authorized Texas Gas to supply Arkansas Power at the Helena connection.

South Atlantic Plan Dies

FPC has dismissed the application of South Atlantic Pipe-Lines Inc., Jacksonville, Fla., for authority to construct a 254-mile natural gas transmission line from Jacksonville to St. Petersburg.

As there is at present no natural gas line in that area and none has been authorized, the commission said that in the absence of a definite source of natural gas, the company was unable to supply the required information, data, and exhibits.

The $23.5 million project was to include, in addition to the 254-mile line, 50 miles of laterals and a compressor station.

Colorado Interstate Seeks Okay for Capacity Increase

Colorado Interstate Gas Co., Colorado Springs, has applied to the FPC for authorization to build facilities increasing the capacity of the company's recently authorized 216-mile line from the West Panhandle field in Texas to a point in Cheyenne county, Colo., in order to meet anticipated needs of resale customers in the Rockies.

Peak day requirements in this area during the past winter were 367,490 Mcf and were met only by overproducing some wells and by emergency purchases of gas. Colorado stated that the anticipated peak day firm demand for 1951-52 is 410,643 Mcf and for 1952-53 it will be 435,839 Mcf.

The company plans a two-year construction program at an estimated cost of $3,453,105, including increasing capacity of the Panhandle field compressor station from 4800 to 6600 hp and the installation of an additional 1320-hp unit at the Kit Carson, Colo., compressor station; building 30 miles of 20-in. loop line from Elbert county, Colo., to Limon, Colo., and 19 miles of 6⅝-in. lateral in the Fort Lynn, Colo. area connecting its system with the new line.

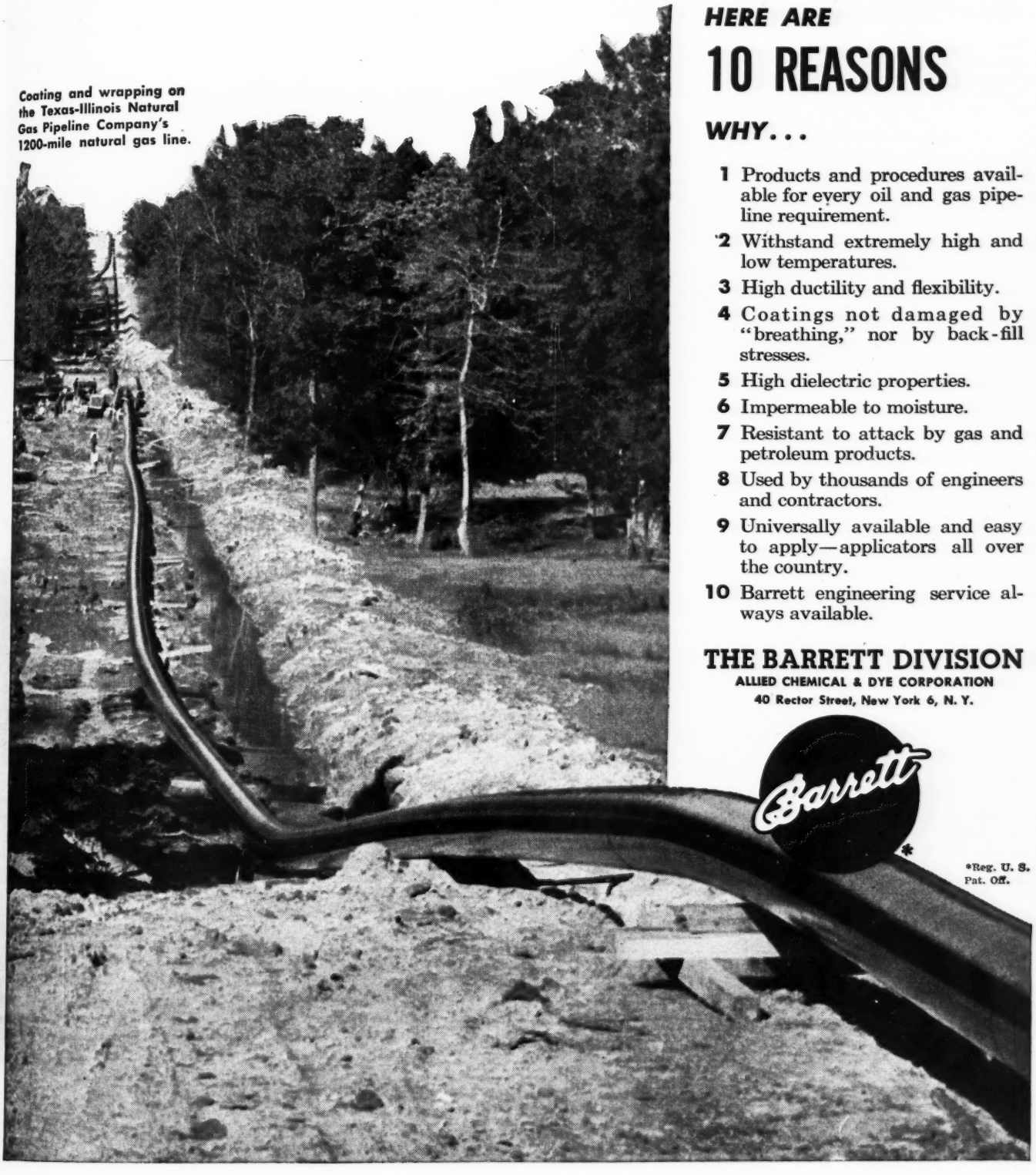
During 1952 Colorado plans to install two additional 1320-hp units at the Panhandle field station and the 1320-hp unit at the Kit Carson station and to build 18 miles of 20-in. loop from Kit Carson to Denver.

Swamps and hills are adding to the difficulties of laying Texas Illinois Natural Gas Pipeline Co.'s main line through northeast Texas. Here workmen bolt together huge cast iron river weights, more than 20 of which were required to anchor the line in this short stretch of swamp. Last month crews of H. C. Price Co. were nearing the Arkansas state line at Texarkana.

BARRETT* COAL-TAR ENAMELS

PROTECT

AMERICA'S GREATEST PIPELINES



Coating and wrapping on the Texas-Illinois Natural Gas Pipeline Company's 1200-mile natural gas line.

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SGA's transmission section round table in Biloxi included (from left) W. A. Broome, Arkansas Louisiana Gas; G. C. Cooper Jr., Mississippi River Fuel; H. H. McDonald, Texas Eastern; E. D. Nuttall and J. H. Echterhoff, United Gas; J. W. Carneal, Texas Gas; W. C. McGee Jr., Tennessee Gas; Aubrey L. Roberts, Texas Gas; Carl E. Cloud, Oklahoma Natural; and E. E. Stovall (rear), Lone Star.

SGA Transmission Section Reviews Pipeline Methods

A comprehensive review of today's techniques in pipeline operation, construction, and maintenance — such timely topics as microwave transmission, off-shore pipelines, gas turbines, and continuous cleaning of pipelines—attracted a jam-packed audience for the second annual meeting of the Southern Gas Assn.'s transmission section when the South's gasmen held their big convention in Biloxi, Miss., April 23-25.

Outstanding was a panel discussion moderated by Carl E. Cloud, Oklahoma Natural Gas, Tulsa, on "Transmission Operating Problems." Some of the highlights:

Louis R. Records and Dwight H. Seely Jr., Sohio Petroleum, speaking on "High Pressure Free Fluid Knockouts"—"The recent advent of the low temperature separator, with the high pressure knockout ahead of it, has increased the utility of the knockout." Detailed effects of temperature and pressure were given, and a typical hookup of a low temperature separator was described.

J. H. Echterhoff, United Gas Pipe Line Co., on "Removal of Liquids from Natural Gas Before it Enters a Pipeline"—"The real problem is not the separation of the gas from a liquid—it is the conditioning of the gas so that, from the time it enters the line initially until it reaches the customer, no liquids will be formed." Mr. Echterhoff's paper pointed out the advantages and disadvantages of the various methods used for removal.

H. M. McDonald, Texas Eastern Transmission, on "Best Methods of Maintaining and Obtaining Maximum Efficiency on Pipelines"—Mr. McDonald described the continuous cleaning method now being employed by the Shreveport pipeline company.

E. D. Nuttall, United Gas, on "Telemetering, Remote Control, and Supervisory Systems"—"The telemetering or remote control of a variable such as pressure, flow, or temperature, the control of remote valves and pressure regulators, and the transmission in the return direction of supervisory signals which say, in effect, 'order received and properly executed,' can be achieved through the proper selection and operation of audio and carrier telegraph signal transmitters and receivers."

E. E. Stovall, Lone Star Gas, reported on the AGA-ASME orifice meter test work at Rockville, Md. (see *GAS*, April 1950, p. 75).

G. Carl Cooper Jr., Mississippi River Fuel, told briefly of tests made on an open cycle gas turbine in operation under pipeline conditions. The test was conducted jointly by Mississippi River Fuel, United Gas Corp., Westinghouse, and Ingersoll Rand in an effort to determine operating characteristics, life, efficiency, and costs.

Other events on the round table included the talk, "Erosion Control," by J. W. Carneal, Texas Gas Transmission (see *GAS*, Aug. 1950, p. 95); a study of the use of mechanized equipment on pipelines, by W. C. McGee Jr., Tennessee Gas Transmission; and "General Corrosion Practices and Economics," by W. A. Broome, Arkansas Louisiana Gas Co.

Capacity Increase Asked

To increase system capacity from 164.2 MMcf to 182.6 MMcf daily, Kansas-Nebraska Natural Gas Co. Inc., Phillipsburg, Kan., has asked FPC to approve a $976,330 project. The extra gas would meet existing demands and serve new markets in Nebraska and Colorado.

Construction includes 117 miles of line ranging in size from 2⅜-in. to 8⅝-in.

In addition to new markets at Big Springs, Brule, Chappell, and Lodge Pole, Nebr., and Ovid and Julesburg, Colo., two industrial customers and two municipal power plants, at Julesburg and Chappell, are to be served.

New Line to Galveston

Two 8-in. lines laid under Galveston bay, Texas, in 1938 are to be replaced by a 12,000-ft, 14-in. line to be built by Southern Union Gas Co., Dallas, at a cost of $200,000.

The pipe has been hauled in and laid out on the shore. After 1000-ft sections have been welded, they will be tested for leaks and flaws.

Eventually, all Galveston's gas will be transported through the new line.

Southern Natural Program Awaits FPC Approval

Southern Natural Gas Co., Birmingham, is seeking FPC authorization for construction of pipeline facilities to increase daily delivery capacity of its system from 555 MMcf to 670 MMcf per day.

The proposed facilities, located in Alabama, Georgia, Mississippi, and Louisiana and estimated to cost $12,641,000, include three compressor stations with a total of 19,450 hp and approximately 169 miles of various size pipelines. They would provide additional capacity for increasing requirements of present markets, and supply communities which the FPC has previously directed the company to serve.

Southern Natural also plans to serve several new markets including Deer Creek natural gas district, Raleigh, and Mize, Miss.; Centerville, Brent, Fayette, Greensboro, Albertville, Newbern, Hanceville, Ft. Payne, Rainbow City, Ala.; and Austell, Powder Springs, Bowdon, Dallas, Dalton, Summerville, Trion, Fort Valley, Thomson, and Villa Rica, Ga.

New compressor stations would be located in Jefferson Davis and Clarke counties, Miss., and Hale county, Ala. The pipeline construction includes a 20-mile supply line in Ouachita parish, La., 33 miles of triple loop line in Ouachita and West Carroll parishes, La., 7miles of triple loop line in Sharkey county, Miss., and 108 miles of 14-in. line extending through Georgia from Bass Junction to Augusta.

Underground Storage Expansion for United Fuel

United Fuel Gas Co., Charleston, has asked FPC authorization for construction of pipeline facilities in West Virginia to expand the company's underground natural gas storage operations and transmission facilities to provide capacity sufficiently flexible to meet market demands.

The proposed facilities, to be located in Putnam and Kanawha counties, include 45 miles of transmission line, a 2640-hp compressor station together with dehydration plant, auxiliary units, and appurtenant equipment, and the transfer of one 1000-hp gas engine unit from the Walgrove compressor station to the Kanawha station.

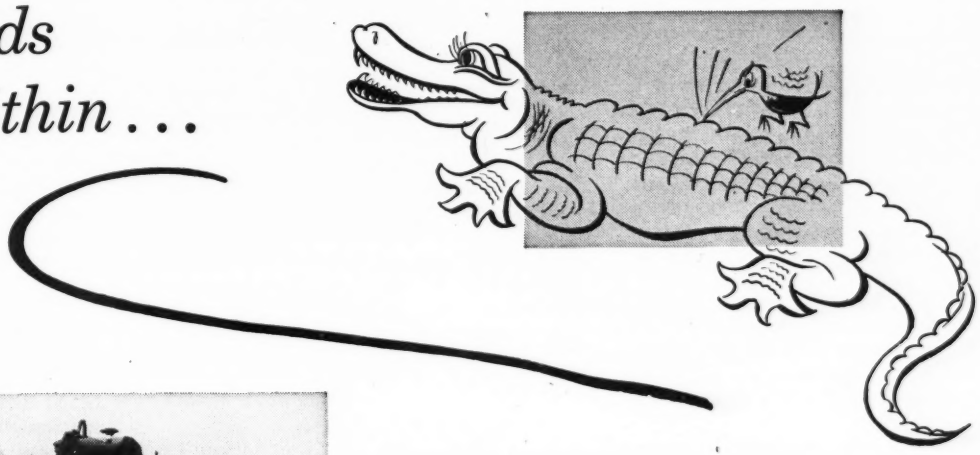
In addition to its 10 storage pools located in depleted gas fields near United's transmission lines and markets, the company plans to activate three additional pools in Putnam and Kanawha counties. Estimated cost of the project is $4,755,830.

El Paso Sells Facilities

Certain facilities located in El Paso, Texas, will be sold by El Paso Natural Gas Co. to its wholly owned subsidiary, El Paso Gas Transportation Corp. FPC approved the sale last month.

El Paso Natural does not have a franchise to do business within the city, and when the city limits were recently extended to include the facilities in question, the transaction became necessary.

Like the 'Gator's tough skin that shields what's within . . .



Johns-Manville Asbestos Felts shield oil and gas pipelines

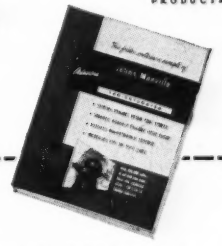
Johns-Manville Asbestos Pipeline Felt—*the only type of wrapper that has survived more than 50 years of service in all types of soil*—now protects more than 100,000 miles of oil and gas pipelines!

A sturdy, inorganic product, Johns-Manville Asbestos Felt resists rot and decay, stands up in both acid and alkali soils. It has the thickness and toughness needed to shield pipeline enamels from earth load and soil stresses. And it permits the protective enamel coating to properly function against corrosion.

Johns-Manville Asbestos Felt is flexible; wraps easily without cracking. It guards enamel from impact damage both during installation of field-wrapped pipe, and during transportation and installation of mill-wrapped pipe.

There are important economic advantages, too! In addition to reducing maintenance expense, Johns-Manville Asbestos Felt adds many years of life to the pipeline. For further information and a sample of Johns-Manville Asbestos Pipeline Felt, mail the coupon below.

JOHNS-MANVILLE JM PRODUCTS



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Please send me a copy of the sample folder on Johns-Manville Asbestos Pipeline Felt, PP-22A.

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100 Gas Savings Banks Pose Accounting Problem

"The gas industry is now operating more than 100 'savings banks,' with deposits as of last Dec. 31 running to 350 billion cu ft. Within a few years somewhere near 1 trillion cu ft will be in storage with a maximum daily deliverability approximating 3 billion cu ft."

And that, said A. A. Cullman, Columbia Engineering Corp., New York, last month, is why company management, its auditors, and its investors are questioning with increasing frequency the accounting procedures being followed in recording this tremendous new asset.

Mr. Cullman spoke as a featured attraction before the AGA Natural Gas Department's spring meeting at Dallas May 7-8.

Mr. Cullman's paper was only one of several that attracted substantial audiences to the two sessions.

The first large-scale installation of gas turbine-driven centrifugal compressor stations for natural gas lines, now under construction by El Paso Natural Gas Co. on its Texas-to-California line, was described in a comprehensive treatment by J. F. Eichelmann, chief engineer for the company, and J. S. Quill, application engineer for General Electric Co., the supplier. Cost and efficiency comparisons with conventional equipment, as well as physical details of the installation, were covered.

What his company and others have done to overcome the five ill effects of pulsative flow in compressor station piping was discussed in a talk, "Experiences in Dampening Pulsations in Compressor Piping Systems," by M. L. Arnold, Richfield Oil Corp.'s (Los Angeles) chief engineer.

"Pipeline companies must have a stable soil cover on their pipelines if they are to supply the consumer with a guaranteed, continuous supply of gas," declared Arthur W. Emerson of the Agriculture Department's Soil Conservation Service, Lincoln, Neb. Mr. Emerson spoke on "Soil Conservation Pays in Pipeline Right-of-Way Maintenance."

Mr. Emerson urged executives to avail themselves of "the best agricultural vehicle available to us"—the Soil Conservation District program—in the interests of developing right-of-way stability. He cited at length the experiences of Natural Gas Pipeline Co. of America in working with the department to maintain soil conservation on its Texas-to-Illinois line, constructed in 1931. This was the first big inch, high pressure gas line ever constructed.

Pipeline Newsnotes

The plan filed in June 1950 by Valley Gas Pipe Line Co. Inc., Houston, to carry natural gas from Texas and Louisiana to Indiana, Ohio, and Michigan has been dismissed by the FPC. The $144,500,000 project was to include a 1000-mile line and, in addition, 500 miles of line in Louisiana and Texas. Valley was granted several extensions for filing exhibits supporting its application but has never submitted such information.

Pacific Gas & Electric Co., San Francisco, has applied to the California Public Utilities Commission for authority to build a 44-mile, 8-in. line south from Salinas and to exercise franchises already granted by communities to be served: Chualar, Gonzales, Soledad, Greenfield, and King City. The $1,488,000 project also will include 32 miles of 2-, 3-, and 4-in. distribution lines. Difficulties in securing the necessary pipe have delayed this extension since soon after World War II.

Oklahoma Contracting Co., Dallas, recently moved its offices from the Mercantile Bank building to a new structure at 6612 Harry Hines Blvd. Adjoining the new site is a warehouse in which the company keeps much of its equipment.

Deliveries from Transcontinental Gas Pipe Line Corp.'s system have been stepped up to 415 MMcf per day and were expected to reach 505 MMcf by June 1. An additional 50 MMcf daily is expected to be available for southern customers by the end of the year, and Transco is considering plans for further increases in capacity next year.

Construction will begin this summer on a 105-mile, 8- and 10-in. line from Piceance Creek gas field west of Rio Blanco to Grand Junction, Colo., according to P. S. Magruder, president of Grand Valley Pipeline Co., Denver. Surveying for the $2,308,000 line has been completed. The Bureau of Mines' oil-shale plant at Rifle will be served, as well as a paper plant to be constructed at Newcastle. Grand Valley is owned by Public Service Co. of Colorado, Unita Gas Co., and General Petroleum Corp.

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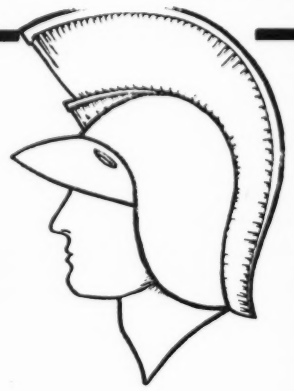
Personal Supervision



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PROGRESS REPORTS

Planned

ARKANSAS-MISSOURI POWER CO., Blytheville, Ark. To build line from Big Inch to serve 12 towns in two states. To start within year.

ATLANTIC GULF GAS CO., 1731 miles, Alabama to Florida, Georgia, South Carolina.

ATLANTIC SEABOARD CORP., Charleston, W. Va., for a 3520-hp station in Randolph county on its Cobb-Rockville line.

CAROLINA NATURAL GAS CORP., Charlotte, N. C., 185 miles, 4 lines, from Transcontinental Gas Pipe Line Corp. main line to North and South Carolina communities.

CENTRAL KENTUCKY NATURAL GAS CO., Charleston, for 12.8 miles 20-in. loop northeast from North Means, Ky., and 18.6 miles of 12¾-in. from Winchester to Lexington, Ky.

CITIES SERVICE GAS CO., Oklahoma City, for 56 miles of 16-, 10-, and 3-in. line in Kansas and 13,080 hp at new and old stations.

CITIZENS GAS CO., Stroudsburg, Pa., **BANGOR (PA.) GAS CO., PEN ARGYL GAS CO.,** subsidiaries of Penn Fuel Gas Inc., laterals to receive gas from Manufacturers Light & Heat Co.

COLORADO INTERSTATE GAS CO., Colorado Springs, 30 miles 20-in. loop from Elbert county to Limon, Colo., 19 miles 6⅝-in. lateral in Fort Lynn, Colo., connecting system to recently authorized 216-mile line; increase Panhandle compressor station capacity from 4800 to 6600 hp; install additional 1320-hp unit at Kit Carson, Colo.

CONSUMERS GAS CO., Toronto, Can., 85 miles, Buffalo to Toronto.

EAST OHIO GAS CO., Cleveland, 65-mile, 26-in. line from near Petersburg, Ohio, to Cleveland, Ohio.

GEORGIA NATURAL GAS CO., Albany, Ga., Phenix City, Ala., to Tallahassee with laterals and branches, $5.1 million.

GULF-MICHIGAN GAS TRANSMISSION CORP., St. Louis, for 680-mile, 30-in. line from Perryville, La. to St. John, Ind. with three compressor stations totaling 30,800 hp.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, to build 117 miles of 2⅜-, to 8⅝-in. line in Nebraska, four town border stations and laterals, measuring and regulating equipment.

LYNCHBURG (VA.) GAS CO., 15-mile line from Transco's line in Appomatox county, Va., to Lynchburg.

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh, for 172 miles of 16-, 20-, and 24-in. line, together with river crossings and measuring stations, from Gallagher township, Clinton county, to Cannonsburg, Pa.

MICHIGAN CONSOLIDATED GAS CO., 180-mile, 24-in. line paralleling present line from storage fields at Austin, Mich. to Detroit.

MICHIGAN GAS STORAGE CO., Jackson, for 78 miles of 16-, 22-, and 24-in. line from Laingsburg Junction to near Pontiac-Mt. Clemens, 3 laterals, 7400 hp, and 30 miles 26-in. loop. All for development of the Riverside storage field.

MISSISSIPPI RIVER FUEL CORP., St. Louis, for a 98-mile, 16- and 18-in. feeder line from Lincoln parish, La. to Woodlawn, Texas, gas field. Also 11-mile, 10-in. lateral to Waskom field, Texas.

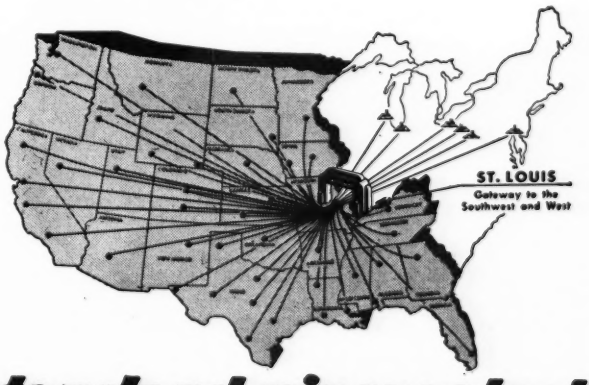
MISSOURI CENTRAL NATURAL GAS CO., Macon, Mo., 25 miles of 6-in. from Moberly to Macon, Mo.

STANDARD'S PROCEDURE . . . provides steel grit cleaning, the accepted efficient cleaning process at no extra cost as compared to conventional methods.

BOND . . . of your coating system, the determining factor of quality application of your coated and wrapped pipe, is accomplished by steel grit cleaning, which is evaluated at 100% efficiency as compared to conventional methods producing 40 to 50% bond efficiency.

STEEL GRIT . . . cleaned surfaces are made of many facets . . . inclined toward each other at various angles which provide bond of the coatings to the steel . . . while conventional cleaning methods tend to polish the steel and reduce bond performance.

COATING AND WRAPPING-IN-TRANSIT . . . permits stop-off for processing or storage at St. Louis without freight penalty. When you ship through the St. Louis gateway, you enjoy "through freight rates" instead of the higher combination rates generally used.



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MONTANA-DAKOTA UTILITIES CO., Minneapolis, interconnecting lines between facilities to be acquired from 3 companies in Montana and Wyoming. Compressor station with two 330-hp units and dehydration facilities, together with addition of two 880-hp units to an existing compressor station.

NATIONAL UTILITIES CO. OF MICHIGAN, Coldwater, Mich., 77 miles in south central Michigan.

NEVADA NATURAL GAS PIPE LINE CO., 114 miles of 10¾-in. line from Topock, Ariz., to Las Vegas, Nev. Includes a 4-in. branch starting 4½ miles west of Boulder City and a 2½-in. branch from 2½ miles west of Needles into the city. To be finished early as possible in 1951.

NEW RIVER GAS CO., Radford, Va., 50-mile line from Atlantic Seaboard's system in W. Va. to a point near Radford with laterals to four towns.

NEW YORK STATE NATURAL GAS CORP., for a 77-mile, 20-in. line from Lawrence county, Pa. to the South Bend storage area, 17 miles of field lines, and a 12,000-hp station. 85 miles 16-in. Utica to Albany; 4 miles 20-in. Murrysville to Tonkin station, Pa.; 11½ miles 20-in. and 12 miles 16-in. Colvin Gate to Preston station, Pa.

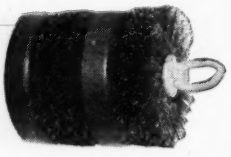
NORTHERN INDIANA FUEL & LIGHT CO., Auburn, Ind., 31-mile, 8⅝-in. line to carry gas to northeastern Indiana. Cost: $511,315.

NORTHWEST NATURAL GAS CO., for 700 miles in Washington, Idaho, Oregon.

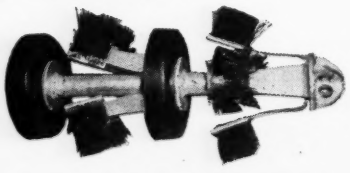
OHIO FUEL GAS CO., Columbus, for 74 miles storage project lines, 47½ miles 20-in. from proposed storage areas to markets, and 10,780 hp for storage service. In Ashland, Hocking, and Knox counties, Ohio. Also 61.3 miles in Sandusky, Elyria and Dayton areas.

THE PIG WITH THE POKE — CLEANS PIPE LINES

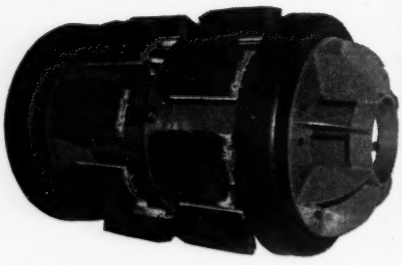
THE VERY LATEST
Williamson Pipe Line Pigs*
FOR CLEANING
NATURAL GAS PIPE LINES



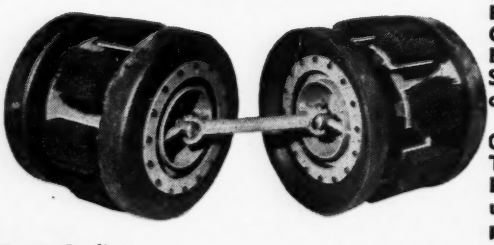
4" Size—TYPE JRN. 2" to 4" sizes. Will pass 1½ R-90° Bends. No valves other than full diameter thru port valves. Use TYPE SCN-51 for 6" size.



8" Size - TYPE WC-11. 8" to 14". Will traverse 6-foot radius field bends, full diameter side openings at 45°. SPRINGS COMPENSATE for BRUSH WEAR.



20" Size - TYPE GP-2. 16" to 30" 200-lb. SPRING forces the brushes against pipe wall — COMPENSATING for WEAR. Will traverse round opening gate or plug valves. SPRINGS and BRUSHES are identical and interchangeable for all types and sizes of GP-PIGS.



24" Size - GP-3. 18" to 30". Sizes will pass 1½ R-30° Bends. SPRINGS COMPENSATE for BRUSH WEAR ASSURING full section cleaning efficiency.

GP-3 consists of two Type GP-1 Pigs— Each Unit may be used as individual pig.

*Patents Pending

T. D. Williamson, Inc.
TULSA 9, OKLAHOMA

PACIFIC NORTHWEST PIPELINE CORP., 2175 miles of 26-in. from southern Texas to Seattle, Wash., Vancouver, B.C., via Oklahoma, Kansas, Colorado, Wyoming, Idaho, Oregon, Washington.

PUBLIC SERVICE CO. OF NORTH CAROLINA INC., Gastonia, 168 miles of laterals connecting with Transcontinental main line in North and South Carolina.

SHENANDOAH GAS CO., Lynchburg, Va., for 59 miles from near Cedarville, Va., to cities in Virginia and West Virginia.

SOUTH CENTRAL ALABAMA NATURAL GAS CO. INC., 150-mile pipeline from a connection with Southern Natural's line in Elmore county.

SOUTH GEORGIA GAS CO., Atlanta, for 527 miles from northern Georgia into Florida to serve new markets in the two states.

SOUTHERN NATURAL GAS CO., Birmingham, 169 miles of various size pipeline and three compressor stations totaling 19,450 hp in Alabama, Georgia, Mississippi and Louisiana.

SOUTHWESTERN VIRGINIA GAS TRANSMISSION CO., Martinsville, 17-mile line from Transco's line near N. C.-Va. state line to Martinsville.

TENNESSEE GAS TRANSMISSION CO., Houston, 45-mile spur from Buffalo, N. Y. to near Niagara Falls, N. Y. Also 266 miles loops between Texas & New York, 100 miles of laterals, 72,000 hp to be added, and crossing of Niagara river. To serve Manufacturers Light & Heat Co.: 25 miles 26-in. loop and 2000 hp along its Buffalo extension. To up capacity and develop a storage project: 438 miles of loop on New England & Buffalo extensions; 44,000 hp in existing or authorized stations, 14,000 hp in a new station. To serve Iroquois Gas, United Natural, and Equitable Gas: 253 miles loop; 61,000 hp; 100 miles miscellaneous lines.

Also a joint project with United Natural Gas Co., Oil City, Pa. for 89,530 ft of pipeline and appurtenant facilities to develop underground storage area in Potter county, Pa.

TEXAS GAS TRANSMISSION CORP., compressor station with 3960 hp on its main line near Shreveport. Also 642 miles main and loop in La., Ark., Miss., Tenn., and Ky. Includes 189-mile line from Acadia parish to Morehouse parish, La. (24- and 26-in.) and 425 miles 26-in. loops. Also 5280 hp near Madison, Ind.; 9340 hp at 4 existing stations; underwater crossings of Ohio & Mississippi.

TRANS-CANADA PIPE LINES LTD., for a 2200-mile line from Alberta to major cities as far east as Montreal.

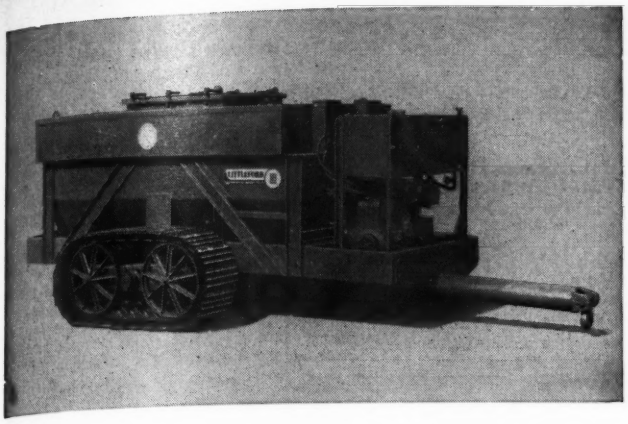
UNITED FUEL GAS CO., Charleston, to build 45 miles in West Virginia, 2640-hp compressor station with dehydration plant, and transfer 1000-hp unit from Walgrove to Kanawha station.

UNITED NATURAL GAS CO., Oil City, Pa. for 10 miles new line and to replace and relocate 10 miles all in Elk, McKean, Venango, and Mercer counties. Add 150-hp units at Hickory and Pinegrove stations and a generator at Knox station.

UTAH NATURAL GAS CO. to build a 360-mile line from the San Juan basin to Salt Lake City. A secondary line would run from Last Chance field (Wayne county, Utah) through Sevier and Sanpete counties.

UTAH PIPE LINE CO., Dallas, for a 392-mile line from Aztec, N. M. to Salt Lake City. Includes 374 miles of 22-in. and 18 miles of 16-in.

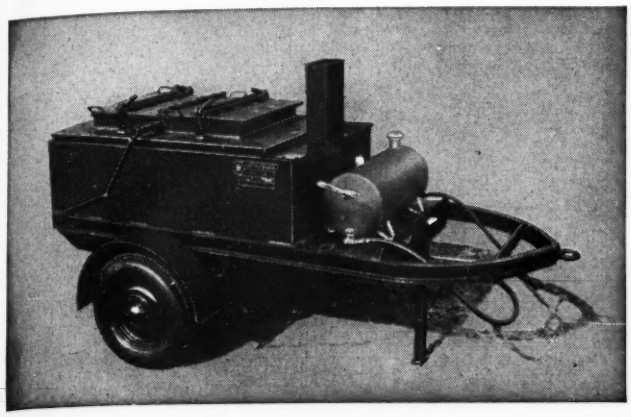
WESTCOAST TRANSMISSION CO. INC., Wilmington, Del., 615 miles, including 277 miles from Sumas, Wash. to Portland, Ore. with short branches to a number of cities in the two states; 266 miles south from the Osoyoos, B. C. area to Spokane and Hanford, Wash.; and 72 miles of laterals and 13 measuring stations.



HYDRAULIC AGITATED KETTLE . . . Model 211-20, 23 barrel capacity. This kettle has only one burner furnishing the heat — lights instantly — no preheating — no electrical ignition — burns diesel fuel or kerosene — burner is low pressure type assuring even distribution of heat which prevents warping or burning out bottoms — made with Trac-Type wheels or Skids for truck mounting.

WRITE FOR COMPLETE SPECIFICATIONS

CROSE-LITTLEFORD PIPE LINE KETTLES . . .



HAND AGITATED PATCH KETTLE . . . Model 84-HD, 225 gallon capacity. This kettle has a manually operated agitator and can be operated from either side. Fast trailing is possible with the Model 84-HD Kettle. A one man operated stiff leg of strong channel iron is provided at the front to support the kettle in the standing position. Also available in 165 gallon capacity.

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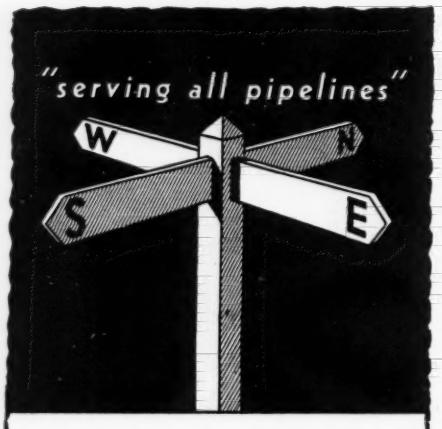

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Approved

GRAND VALLEY PIPELINE CO., Denver, a 105-mile, 8- and 10-in. line from Piceance creek to Grand Junction and Rifle, Colo.

UNITED GAS PIPE LINE CO., Shreveport, 39 miles 16-in. from Baldwin county, Ala., to Escambia county, Fla.; two laterals to Saufley field. Also tap and sales meter stations.

Under Way

ALGONQUIN GAS TRANSMISSION CO., Boston, facilities to serve designated companies in Mass., R. I., Conn., and N. J. Includes 253 miles of main line and 279 miles of laterals.

CITIES OF BOONEVILLE, RIPLEY, BALDWYN, Miss., to connect with Tennessee main line in Benton county, 16 miles of 6-in., 23 more miles, 11-mile tap.

CITIES SERVICE GAS CO., Oklahoma City, has Knupp Construction Co. Inc., at work on 29 miles 16-in., Wichita to Newton; taking up 66 miles 6-, 8-, and 10-in. near Newton.

CITY OF TRINIDAD, COLO., a 35-mile, 8⅝-in. line from Colorado Interstate's facilities to a distribution system to be built in Trinidad.

COLORADO INTERSTATE GAS CO., Colorado Springs, a 215-mile, 20-in. line from the Texas Panhandle to Colorado.

EAST TENNESSEE NATURAL GAS CO., Nashville, has Engineering Construction Co. of Tulsa working on 3- and 4-in. laterals at Loudon, Lenoir City, Monteagle and Mt. Pleasant, Tenn. a river crossing of Tennessee river near Lenoir City and a bridge crossing on Ft. Loudon. Reservoir near Loudon, Tenn.

EL PASO NATURAL GAS CO., to increase deliveries to Phoenix, Ariz., 31 miles 16- and 10-in.; 11.5 miles 4½-in.; 5.5 miles 12¾-in.; six metering and regulating stations. To increase system capacity by 400 MMcf, 93 miles 26 & 30-in. loop between Permian basin & Ariz.-Calif. state line; 180,850 hp in new & existing stations; 311 miles in its field system; 42,370 hp in field stations, and appurtenant facilities.

EQUITABLE GAS CO., Pittsburgh, compressor station in Washington county, Pa. including 3300 hp, glycol dehydration plant, scrubbers, etc.

HOPE NATURAL GAS CO., Clarksburg, W. Va., has Pipe Line Construction & Drilling Co. working on 34 miles of 8-, 10-, and 12-in. line from Fairmont, W. Va. to Terra Alta, W. Va.

HUGOTON PRODUCTION CO. has Reese Bros. Construction Co., Hugoton, Kan. at work on a 40-mile, 4- to 20-in. gathering system near Ulysses, Kan.

INTERSTATE POWER CO., Dubuque, Iowa. 26½-mile 8⅝-in. line to the Clinton, Iowa area. Includes a submarine crossing of the Rock river and a double submarine crossing of the Mississippi.

KANSAS NEBRASKA NATURAL GAS CO. INC., Hastings, Neb., has Engineers Limited Pipeline Co. working on submerged crossings of the Loup and Cedar rivers in Nebraska.

LAKE SHORE PIPE LINE CO., Cleveland, Ohio, 45-mile, 10¾-in. line from Meadville, Pa. to Ashtabula, Ohio.

NEW YORK STATE NATURAL GAS CORP., New York, 164 miles of 16-in. from Dryden to Albany, N. Y.; 56-mile line from Dryden terminus to a storage pool in Tioga county, Pa.; facilities for a new storage pool. Also 44½ miles of 16- and 18-in. to connect the Leidy gas field with its system in Penn. Williams Austin Co., Pittsburgh, is at work on 4½ miles 20-in. in South Bend storage field area; will build 37 miles from there to Ithaca and 23 miles to Angelica, N. Y. Also 82½ miles 20-in. from Utica to Ithaca and 85 miles 16-in. from Utica to Albany. These projects will be completed during 1951.

NIAGARA MOHAWK POWER CORP., Syracuse, Williams-Austin Co., Pittsburgh, is at work on 40 miles of 10-, 12, and 16-in. laterals.

NIAGARA MOHAWK POWER CORP., Syracuse, 55-mile, 10¾-in. line to supply Watertown and other communities.

NORTHEASTERN GAS TRANSMISSION CO., Springfield, Mass. 500 miles of line from Tennessee Gas Transmission Co.'s system near Pittsfield, Mass., and from Transcontinental's system near Greenwich, Conn. and metering and regulating facilities. To serve companies in Conn., Mass., and N. H. Includes 144 miles 24-in. from Pittsfield to Wakefield, Mass. to be built by Oklahoma Contracting Co.; 100 miles 16-in. from Greenwich, Conn. to Sprinfield, Mass. to be completed by Aug. 1 by Britton Contracting Co. Inc.; and 225 miles 3- to 12-in. laterals and 35 meter stations, all to be constructed in 1951.

NORTHERN NATURAL GAS CO., Omaha, has Reese Construction Co. at work on 190 miles of 4- to 16-in. gathering system in Hugoton, Kan., R. H. Fulton & Co. on 24-in. underground crossing of Cimmaron river, Ulysses, Kan.

OKLAHOMA NATURAL GAS CO. has Tulsa Pipe Coating at work on 40 miles 16-in. from County Line to Ninnekah, Okla.

PACIFIC GAS & ELECTRIC CO., San Francisco, has Bechtel Corp. building compressor stations at Topock, adding 6 compressors totaling 15,000 hp; Hinkley, adding 7 compressors totaling 17,500 hp; and Kettleman Hills, adding 8 compressors totaling 12,320 hp.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, has Conyes Construction Co. at work on 129 miles 30-in. Ill.-Ind. loop line; Anderson Bros. Inc. on 43 miles 26-in. loop in Mich.; Midwestern Constructors 10% complete on 3 compressor station additions. Knupp Construction Co. Inc. working on 16 miles of 4-in., vicinity of Liberal, Kan., and Rumsey Bros. Pipe Line Co. on 42 miles 26-in., four loops in Missouri and Illinois.

PENNSYLVANIA GAS CO., Warren, 52-mile 12¾-in. line from Warren to Erie, Pa. and 5 new compressor units.

PIEDMONT NATURAL GAS CO. INC., Spartanburg, S. C., six laterals totaling 74 miles from Transcontinental main line to North and South Carolina cities.

SOUTHERN NATURAL GAS CO. Birmingham, has Latex Co. of Georgia at work on 35.31 miles of 8⅝-, and 8¼-in. from Opelika, Ala., to La Grange, Ga.

TENNESSEE GAS TRANSMISSION CO., Houston, 303-mile extension from Erie county, N.Y. to N.Y.-Mass. line; 787 miles of loop along existing or authorized line from Texas to Buffalo; 111,680 hp in existing, authorized, or new compressor stations; 75 miles of laterals. H. C. Price Co. is building 156 miles of 24-in. line from Hamburg, N. Y. to the Onondaga-Madison county line. Houston Contracting Co. is at work on 158 miles of 30-in. line from Jones, La. to Cypress, Texas.

TEXAS EASTERN TRANSMISSION CORP., Shreveport, to boost capacity to 1205 MMcf, 791 miles 30-in. from Kosciusko, Miss., to Connellsville, Pa.; seven compressor stations with 46,400 hp on new line, six with 52,500 hp on existing line; short lines in New York area. Williams Brothers-Davis Co. is at work on 163.6 miles of 30-in. line from Kosciusko, Miss., to the Tennessee river. Mahoney Contracting Co. at work on 35 miles of 30-in. from Fayette county, Pa., to Westmoreland county, Pa.

TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, on its 1331-mile line, Midwestern Constructors Inc., 102 miles of 30-in. from Mississippi river near Chester, Ill. to St. Elmo, Ill. 42% completed; 100 miles 30-in. from Effingham to Sibley, Ill., 92 miles 30-in. from Sibley to Joliet, Ill. 12% completed; Mississippi river crossing at Wittenberg, Mo. started June 1; crossing the Illinois river near Morris, Ill. 90% completed. Bechtel Corp. under way on 106 miles 30-in.

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from Texas-Ark. line to Malvern, Ark., 39% complete; and 74 miles 30-in. from Newport to Moark, Ark., 90% complete; on 130 miles Malvern, Ark. to Newport, 2.7% complete. Fish Constructors Inc., Houston, is building compressor stations. H. C. Price Co. at work on 98 miles of 30-in. from Urbana to Garrison, Texas, 18.2% completed; also on 96 miles 30-in. from Garrison northeast to Texas-Arkansas state line near Texarkana, 5.7% completed.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston, 17 miles 30- and 10¾-in. from Bergen county, N. J. to Paterson, N. J. and an 11-mile line from East Carteret, N. J. to Brooklyn. Also 45,675 hp in compressor capacity at existing stations and 41 sales meter stations.

TEXAS GAS TRANSMISSION CORP., to develop the Alford storage field near Petersburg, Ind. a 12-mile line, 4½ miles field lines, a 1200-hp storage field station.

TRUNKLINE GAS CO., Houston, has Anderson Bros. Corp., also of Houston, at work on 180 miles, 26-in., Darnell to Senatobia, Miss., and 217 miles 24-in. Longville to Garwood, Texas. Parkhill Truck Co. stringing above jobs. On 740-mile, Louisiana-to-Illinois line, R. H. Fulton, Lubbock, Texas, is working on 278 miles of 12- and 20-in. and 184 miles of 26-in. Mahoney Contracting Co. under way on 186 miles of 26-in. 50% completed. Four major river crossings to be made under Mississippi, Ohio, Washita, and Red rivers. Anderson Bros. have contract for the first, J. Ray McDermott & Co. for the other three. Project will include six other river crossings for which contracts are not let.

UNITED FUEL GAS CO., Charleston, W. Va., 45 miles, 3640-hp compressor station to deliver gas to storage pools in West Virginia.

UNITED GAS PIPE LINE CO., Shreveport, 1005 miles in Texas, Louisiana, and Mississippi. Includes 451 miles 30-in., 6 miles 26-in., 53 miles 24-in. from Agua Dulce field in south Texas to Monroe, La.; about 245 miles of 30, 26, 24, and 20-in. from Gulf of Mexico northeast to Jackson, Miss.; 215 miles from this line to near Kosciusko, Miss.; 24 miles 8, 12, and 16-in. in south Louisiana; 16 miles of 16-in. from Koran gasoline plant site, La., to its Carthage-Sterlington line in Louisiana; 4000-hp compressor, dehydration plant. Contracts have been awarded to Brown & Root Inc., Houston, for engineering, construction, and other services and to Gulf-Southern Contractors, Fort Worth, for other major work on the project. In offshore fields in Gulf of Mexico: 12.3 miles 14-in. line. Texas-Louisiana Contractors building 52 miles 20-in. line from Needville to Freeport, Texas. Tie-in and testing now under way. H. C. Price Co. has signed a contract for the Somastic coating of 137 miles of line to be laid in south central Louisiana. Associated Pipe Line Contractors Inc. at work on 100 miles of 20-, 24-, 26- and 30-in. from Franklin to Morgan City, La. Also under way are 68.1 miles 16-in., 25½ miles 6-, 8-, 10- and 12-in. gathering lines from fields in Plaquemines parish, La. to New Orleans.

Contracts Let

CITIES SERVICE GAS CO., Oklahoma City, to Cheek Construction Co. for 100 miles of 4-, through 20-in. gathering system east of Ulysses, Kan.

EQUITABLE GAS CO., Pittsburgh, to Poston Construction Co. for 15 miles 16-in. on north and west sides of Pittsburgh.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, to R. H. Fulton & Co. for 20 miles 24-in. and 48 miles 26-in. in five loops from Sneed, Texas, to Olpa, Kan.

SOUTHERN CALIFORNIA GAS CO. and **SOUTHERN COUNTIES GAS CO.,** Los Angeles, to Alex Robertson Co. and Engineers Ltd. Pipeline Co., 24 miles 30-in. encircling Los Angeles metropolitan area. To begin June 4. SoCal to J. E. Young Pipeline Construction Co. and N. P. Van Valkenburgh Co. for 21-mile loop from tie-in point near Simi to east bank of Santa Clara river, to begin July 16.